Gal to. 8 d

An Attempt to explain the

OECONOMY
OF THE
HUMAN FRAME,
UPON THE
PRINCIPLES
OF THE
NEW PHILOSOPHY.

> *Vita igitur in ſanguine conſiſtit (uti etiam in ſacris noſtris ligimus) quippe in ipſo vita, atque anima primo elucet, ultemoque deficit, ut cuilibet cernere eſt, Sanguinem ultimo calorem (pulſus, vitæque authorem) in ſe retinere: quo ſemel prorſus extincto, ut jam non amplius ſanguis eſt ſed cruor, ita nulla poſtliminio ad vitam revertendi ſpes reliqua. Patetque hoc idem luculentiùs quia nec in omnibus animalibus neque omni tempore cor pulſans reperitur, cum ſanguis tamen aut ejus Analogon in nullis unquam deſideratur.*
>
> Vid. paſſim in Exercitat. LI. de generat. Animal. Harv.

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MUSEUM BRITANNICUM

THE

Human FRAME.

INTRODUCTION.

THERE are two ſorts of human Learning to learn: That which others have already learned, which comes by Inſtructions from Writings, Words, or Examples; and that which has not yet been learned, which is acquired by Obſervations, and Compariſons of Opinions, Actions or Things. This Age very unjuſtly prizes the one, and deſpiſes the other, admires old Knowledge, and ridicules new; which is the Reaſon we have ſo few beneficial Improvements. And it is obſervable, that Men who are Maſters of, and full of the one, ſeldom do any conſiderable Thing in the other. Moſt Scholars learn to tell us, learnedly, what we know or have in uſe; few learn to tell us any thing we know not. Men who learn to mind Words, ſeldom mind Things;

Things; and Men who ſtudy Things, ſeldom mind Words. A Man may have vaſt Ideas or Conceptions of Things, and little or none of Words. And moſt People who ſpend their Time in diſcovering any thing we do not know, or which is not in uſe, tell it us but confuſedly at firſt.

'Tis neceſſary that the Perſon who attempts to diſcover the Motions and Actions of Bodies whether Solids or Fluids, ſhould have a large extenſive Capacity, naturally, to compare many Ideas at once; a good Share of natural Reaſon, and be inſtructed ſo far in the Mathematicks as concerns the Solids, or Fluids he obſerves, to enable him to make juſt Obſervations, and to have ſufficient Opportunity to make Obſervations and draw Concluſions; that he underſtand ſo much of one Language, that others, who underſtand the ſame Language, may underſtand what he deſigns ſhould be underſtood. But 'tis not neceſſary that he underſtand many Languages, nor that he know how many have made deficient Obſervations, and drawn falſe Concluſions. Such a Multitude of Opinions are likely rather to perplex or deceive, than to direct him to the Truth. Nay as our Comprehenſions are not infinite, the more Ideas he has of

Things which concern not the Matter in hand, the leſs room he will have for thoſe that are neceſſary.

The preſent Phyſicians read the Obſervations former Phyſicians have made; what Symptoms attend this or that Diſeaſe in their ſeveral Stages, and can thereby gueſs what the Patient has undergone, and what he has yet to undergo; and likewiſe the Effects that this or that ſort of Medicine has had in clogging or diſcharging the Matter, which, in this or that Caſe, produces ſuch or ſuch Symptoms; but this ſhould be the leaſt part of a Phyſician's Skill. Few or none of them ever look back to the Cauſe, and ſhew us whence that Diſeaſe took Root, and what Cauſes produced thoſe Effects. The principal Part ſhould be to judge what the Matter is that offends, and how it offends; how it was produced or retained, and why it was not diſcharged; if any of the Glands have been too ſtraight, to widen them; and if any have been too wide, to ſtraighten them; or if the Juices have been too ſubtle, or too craſs, to change them; if any ſort of Meat, Drink, Action, either by Exceſs, Quality, or Deficiency, have produced it, to direct the contrary both in Quantity

and Quality; that what offends might
be diſcharged naturally without Force;
and any new Productions or Increaſe of
it, for the future prevented; why this is
not better cleared, whether 'tis becauſe
1 they think ſo long as they act by Exam-
2 ple, they are ſafe; or 'tis becauſe it re-
quires too much Labour and Study to
3 underſtand natural Cauſes; or that 'tis be-
low them to condeſcend to make Obſer-
vations upon the moſt common or minute
Things, and to begin to lay their Foun-
dation on the Ground, and ſo build up-
4 wards; or that Diſorders come by chance,
5 and are beſt cured ſo; or that 'tis ſuch a
Myſtery that it can never be made a Sci-
6 ence, or that 'tis againſt their Intereſt it
ſhould be made ſo; or whatever be the
Reaſon, till the prime Agents be known,
which work every thing in us, and the
Manner how they act, and their Actions
be demonſtrated by plain, ſimple, mathe-
matical Rules (I had like to have ſaid
mechanical) 'tis impoſſible for them to
lay down plain Rules how to prevent
Diſorders, remove them, or prevent their
Returns. If ever thoſe Matters be ſet in
a clear Light, it muſt be by thoſe who
ſtoop ſo low as to make Obſervations
upon all, even to the moſt minute Things,

Motions, and Circumſtances, which any way affect, or concern the Body, and without Regard to the received Notions or Opinions, give Judgment as the Things appear to them; and whenever there is an Attempt to do it, 'tis the faireſt way to let the Brat have no Credit nor Diſcredit by the Parent; and if after 'tis ſet forward, it cannot live by itſelf, to let it die.

CHAP. I.

Some Poſitions about the Motion of Bodies in Fluids.

Primary Qualities not to be accounted for by us.

I Attempt not to account for the Qualities of Bodies, either Solids or Fluids, ſuch as Gravity, Elaſticity, *&c.* Nor for the Sizes, Shapes, or Figures of the firſt Corpuſcles of each ſeveral Species of Bodies, whereby each of the Bodies differ from any other in ſeveral Qualities or Attributes: Thoſe, and the Conſequences which reſult from them, ſhew the great Power and Wiſdom of the Creator, but come not within the Reach of Obſervation: Thereby we can only know what Qualities, Sizes, Figures, &c. thoſe Maſſes

ſes which come under our Obſervation have, and how ſome of them move, and are moved, impelled, and rebounded by themſelves or by one another, downward, upward, &c. and how others are interrupted, and reſt, by the different Qualities, or different Degrees of thoſe Qualities in their ſeveral Maſſes; and how thoſe Motions are ſucceſſively renewed or repeated, their Directions varied, and how they move and reſt alternately, by the Diminution, Augmentation, or Complication of ſome of thoſe Qualities occaſioned by the Alteration in Magnitude, Figure, or Dimenſion of ſome, the Maſſes being divided, united, compreſſed, extended, &c. And conſequently how the ſeveral other Qualities or Attributes which reſult from the Size, Figure, Contexture, Mixture, &c. of the Maſſes, ſuch as blunt, ſharp, hard, ſoft, porous, ſolid, brittle, flexible, &c. are altered or complicated.

In the common Courſe of Nature here, all Compoſitions or groſs Bodies are formed, and all Corpuſcles, or ſmall Maſſes move in Fluids; and they and the Fluids are moved, either by external Cauſes or Agents, as Wind moves the Water, and Bodies in it, &c. or by the Impulſe of ſome Agents put into Motion before they enter the Fluid, as Corpuſcles of Fire in Steam move Fluids, and the Bodies in them, as they pervade, &c. or by the Preſſure of the Atmoſphere, or by the Quality of Gravity, or Elaſticity. The ſmall Bodies or Maſſes in Fluids move, and are moved, by the different Qualities, or different Degrees of Qualities, in them, and the Fluids. Every Maſs of any conſiderable Bigneſs, immerſed in a Fluid, which weighs more than the ſame Bulk or Dimenſion of that Fluid, will ſink in it, and every one which weighs leſs than its Bulk or Dimenſion, will ſwim in it. But ſmall Particles or Corpuſcles of Bodies, which in Maſs have not much more or leſs Gravity than the Fluid, eſpecially if the Particles be extended in Breadth or Length, or the Fluid be in Motion or agitated, will hover or be toſſed about in that Fluid and not ſink, or riſe ſuddenly: If they differ much in Gravity, and be of proper Figures for Pervaſion, they riſe or fall with Celerity, in Proportion to that Difference of Gravity and Fitneſs of Figure. But the ſame Matter will be moved in different or oppoſite Directions, by altering its Gravity or Figure, or the Gravity of the next neighbouring Bodies or Fluids, by Addition, Subſtraction, Multiplication, or Diviſion, performed amongſt themſelves, by their other Qualities in their Motion. If a lighter Body be ſubſtracted, ſeparated, or taken from an heavier Body, the Body lighter than the Fluid will riſe, and the Body heavier than it will ſink, or reſt at the Bottom. If the Number of Bodies which will hover in the Fluid be multiplied, either by adding more Corpuſcles of like Gravity, or by dividing the Maſſes which ſunk in it, or &c. for Example, Sea Salt, Sugar, &c. diſſolved in Water, the Fluid will be heavier, and thoſe Bodies, which had a little more Gravity and ſunk in it, will ſwim, *& e contra.* If Bodies which hovered or ſunk be divided ſmall enough, or have lighter Bodies joined to them, thoſe which ſubſided may riſe into or ſwim upon the Fluid, and thoſe which hovered in it may ſwim upon it; nay, even both may riſe out of that Fluid, and hover or ſwim in a lighter Fluid, as out of Water, into Air, &c. When any Maſs in a Fluid is expanded or ſtretched into a Bubble by the Corpuſcles of Fire, volatile Salts, Air, &c. till it be lighter than the Fluid, 'tis preſs'd up with Velocity in Proportion to its Difference in Gravity to the Surface, and there ſwims or burſts, and its Parts fly into or ſwim in the Air, as thoſe of Barm, Soap, &c. or by the Quality of Elaſticity, for the lighter the Fluid, the more, ſmall Bodies in it, which have Elaſticity, will expand or extend themſelves, and the Fluid, and then Bodies which ſwim in that Fluid will ſink; and the heavier the Fluid, the more ſuch Bodies will be compreſſed in it, and that will make the Fluid ſtill heavier, and Bodies, which ſunk in it before, will then ſwim. Or by the Elaſticity, or Adheſion of the Parts of Bodies when they are ſplit or divided, which jirk upward or downward, this Way or that Way, expand and make the Fluid lighter, and throw themſelves or other Bodies they ſtrike upon, or adhere to, in any Direction or upward, out of the Fluid. Bodies in a Fluid move like Weights in the Scales of a Balance, when one ſubſides, others go up with Force and Velocity, proportionable to the Difference in Gravity or Levity to that of the Fluid, the external Impulſe, Preſſure, Diſtance they move, &c. And the Fluids and Bodies next adjoining take their Places, and ſo ſucceſſively others take the Places of them, till the ſinking Body reſt, each of the adjacent be mounted a little higher, er, and each placed according to their reſpective Gravities. When Fluids, &c. fill any Veſſel, which may be extended, and whoſe Sides are of equal Strength, and equally compreſſed; if one Side be preſſed more inward than the reſt, all the oppoſite Sides muſt be preſſed as much in the whole outward; when the Fluids, &c. expand ſuch a Veſſel, which contains them, it muſt extend equally in all Parts, their Gravitation upon the Bottom and Sides only differing: If the expanded Fluid gets vent, and iſſues out in any part, it will iſſue with Force proportionable to that which impells or expands the Fluid, the Compreſſure of the Sides of that which contains it, the Straightneſs of the Aperture, and its own Gravity, if it deſcend; only leſſened by the Preſſure upon the Aperture, and its own Gravity, if it aſcend: And that Spout will continue iſſuing ſo long as the Fluid expands, or rarifies beyond the Capacity of the Veſſel: If it be conveyed thence in a Pipe, ſhut at the farther End, and empty, which is not more or leſs compreſſed, than that it iſſues out of, it will meet with no Reſiſtance till it come at the End of the Pipe: If the Pipe would widen or ſtraighten as the Force within, or the Compreſſure without prevailed in the whole, or in any one Part more than another, and the Force which drove the Fluid were to operate all at one End, like a Pump or Forcer by Jirks, and the Compreſſure without were equal in all Parts, the greateſt Force or Streſs would be at the End of the Pipe, next the Pump, it would extend moſt, and be liable to burſt the ſooneſt there; and the Extenſion would be ſtill leſſer at the greater Diſtance from the Forcer; if the Compreſſure were leſſened or taken off that or any other Part, it would be more extended there in Proportion, and if the Compreſſure were encreaſed in any Part it would be ſtraightened there in like Proportion. If what expands and drives the Fluid go along with it, or in it, and the Preſſure be equal on the outſide, it will be equally expanded in all its Parts. If many Pipes or Tubes never ſo ſlender or weak made of Matter, which will extend to ſuch a Degree, environed with a Caſe or Compreſſure, ſufficient to keep them all from extending beyond that Degree, be equally extended by the ſame Force, at the ſame Time, till they fill the Caſe, and one preſs againſt another, be that Force never ſo great, none of them will burſt; if the

Caſe will extend and contract, and the Force which extends the Tubes be greater than the Compreſſure and Strength of the Caſe, it will extend, if leſſer it will contract; if the Force in any one of the Tubes or Pipes be leſs than the reſt, it will contract more than the reſt, if greater, extend more than the reſt.

Our Bodies are ſo ſurpriſingly contrived and adapted to the Qualities of inanimate Bodies and Fluids, that every Thing, within and about us, acts according to the Laws of *(the Agents which they ignorantly call)* Gravity, Fluidity, Elaſticity, &c. The Fluids within us move and are moved, by ſuch Impulſes, as they are without; and ſuch Corpuſcles, as are ſharp, ſmooth, &c. without our Bodies, are ſo within, and are united, divided, and ſeparated as they are without; and they are no otherwiſe changed within, than they are without, viz. by Union, Diviſion, and Separation, which is occaſioned by their Motion, Taction, paſſing Strainers, &c. And the Motion of the Fluids within, is encreaſed by greater Proportions of volatile Spirits, Fire, &c. as they are without, by greater Emiſſions of Heat from the Sun, from Fire, Manure, &c. and retarded by a greater Proportion of Cold, heavy Matter, &c. with this Difference, that every living Body needs Supplies of Matter, to furniſh Agents to keep the Motions going, and the great Body of this Globe needs none, except Heat from the Sun. And perhaps the Motions of the Fluids in both are, in ſome Meaſure, altered by the Qualities in, or Motion of, the Moon and other Orbs. Man's Body is formed of Parts called Supporters, Pillars, Clothing, or Covering, Partitions, Rollers, Wedges, Levers, Pulleys, Cords, Preſſes, Bellows, Sieves, Strainers, Canals, Receptacles, and by many other comparative Names which the Anatomiſts uſe. Each is at firſt formed in the Womb of a Woman, and by her nouriſhed. After its Birth, the Stomach and Guts, are ſucceſſively filled with what it eats or drinks, from whence the other hollow Veſſels are filled with Fluids, ſome with a Mixture of all ſorts together, ſome with this, ſome with that ſort ſeparated; the greateſt Part kept in perpetual Motion, ſome ſmall Quantities kept ſtagnant to ſupply proper Occaſions at proper Seaſons; the whole is ſo framed, as to need a continual Supply of proper Matter in the Womb, to form and nouriſh it; and after that, to keep the Parts of it in Motion, and to augment for ſome time, and to ſupply the Waſte of thoſe Parts. That Matter is compoſed of a Mixture of various ſorts of Fluids, and Atoms, of various ſorts of vegetable Matter, &c. which lies diſperſed through the whole Surface of the Earth, in the Waters, &c. The Atoms of Fluids are raiſed in Vapours, ſink into the Ground, riſe and pervade the Earth in Steam, and they, and thoſe of the Solids, are by the ſame Agents, as act in and upon Man's Body, raiſed in the Surface of the Earth, and collected by the Fibres of the Roots of Trees and Plants, in a ſort of Halitus or Steam, carried along their Tubes through ſeveral Strainers or Glands, part nouriſhes, forms, and encreaſes the Roots, Stems, Branches, Leaves, and Fruit, and part is diſcharged as Excrement. Theſe Atoms thus collected, and formed into Roots, Plants, Seeds, and Fruits, are ſome of them fitted for the immediate Nouriſhment of Man, ſome for his other Uſes, ſome fitted for the Nouriſhment of Beaſts, Birds, Fiſhes, &c. and of ſeveral ſorts of theſe Animals, ſome are fitted for the Food of Man, ſome for the Food of other Animals, ſome for the Service of Man, and all for his Benefit, as I have ſhewed in another Place *. Thoſe fitted for the Nouriſhment of Animals are by them collected and preyed upon, and their Bodies by the ſame Agents, in the Stomachs of thoſe which eat them, are again divided, and what is fit to form and keep their Parts in Motion, and to grow and ſupply their Parts, is carried off from the Stomach, and Guts, in Steam or Halitus, ſorted by Glands, &c. and the reſt diſcharged in Excrement. The Fleſh of thoſe fitted for the Food of Man is by the ſame Agents again divided in the Stomach of Man; part carried off in Steam for the Uſes aforeſaid, and part caſt out in Excrement, ſo nothing is fitted for thoſe Uſes in Man till it has ſeveral Times, at leaſt once, been divided infinitely ſmall, carried from the Earth, or Excrements in Form of Steam, paſſed proper Strainers, and been ſeparated from the uſeleſs or hurtful Atoms.

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* See Vol. XII. State of Nature.

CHAP. II.

The Things neceſſary to keep theſe Fluids in Motion.

THE Things abſolutely neceſſary to keep theſe Fluids in Motion, and to move the Parts, &c. are, 1. A ſufficient Quantity of ſuch properly prepared Fluids and Solids taken ſucceſſively, at proper Diſtances of Time, into the Stomach, without which, or by the Exceſs or Defect of which, the Fluids will run too faſt, or too ſlowly, and in a ſhort Time ſtand ſtill. 2. The natural Compreſſure of the Air, which is common to all, in all Places, unleſs taken off by Art, and then there is immediately a total Ceſſation of all Motion. 3. A ſufficient Degree of Warmth or Heat from the Sun, Fire, Clothes, Action, or &c. In this we generally err in Exceſs by Cuſtom, and Man might live much cooler than we keep ourſelves. But an extraordinary Defect of this ſometimes occaſions Efforts, which we call Fevers, and in a ſhort time puts a ſtop to the Motions of the Fluids, ſometimes ſuddenly. 4. Air ſufficiently pure, to ſerve for Reſpiration, this is generally common to all, except it be taken away by Art, or fouled by ſome Accident, or where it cannot have Motion, and in ſuch Caſes that Defect puts an immediate ſtop to all Motion. 5. Reſt or Sleep, without which in a ſhort Time their Motions are ſoon diſordered, and in a ſhort time after, ceaſe. But as I take the two firſt to be chiefly concerned in what I am enquiring after, I ſhall firſt conſider what concerns them, and the other three only accidentally, or afterwards.

CHAP. III.

The Qualities of the ſeveral Sorts of Matter put into the Stomach, and of the Juices ſecreted into it, out of the Blood.

IN order to have ſome Notion of the Operations performed in our Stomachs, it will be neceſſary to conſider the different Sorts of Matter put or ſecreted into them, what natural Qualities they have, what Figures their Corpuſcles are of, which of them may be conſidered as active, and which as little other than paſſive, what external Cauſes compreſs, move, or affect them, what Motion and Effects thoſe Bodies with ſuch Qualities and Figures will, when all together, and wrought upon by ſuch external Cauſes, produce one upon another, and upon what contains them.

The ſeveral ſorts of Meat we eat and drink, I ſuppoſe, are compoſed of Corpuſcles of Water, Oil, earthy Matter, Salts, Air, Fire, and Cold maſhed and mixed all together, and along with them, the Saliva or Spittle ſecreted out of the Glands in the Mouth * and Throat, and a ſubtile Fluid like a Mixture of Salts and Spirits meets them there, which either is ſecreted or iſſued into the Stomach, or conſtantly remains there, and ſuch a Quantity of Corpuſcles of Fire, as form what we call natural Heat.

Qualities of Water.

The natural Qualities of Water are Gravity and fluidity, whereby every Body, heavier than its Bulk of Water, ſinks in it, and every one lighter ſwims, and when any other ſorts of Matter are mixed in it, thoſe Qualities are encreaſed or diminiſhed

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* Or thus, a lubricating Mucus from thoſe of the Fauces, and a Liquor analogous to that of the Salivary Glands, which is conſtantly ſecreted, and iſſuing into the Stomach, and a Quantity of, *&c.*

ed in Proportion to the Degree of thoſe Qualities in the Mixture. Its Corpuſcles are extremely light, ſmall, and capable of being expanded, divided, and carried off by corpuſcles of Fire, Air, Spirits or volatile Salts, and are round, ſmooth, or ſo figured that they pervade, but do not wound or cut other Bodies, nor divide the corpuſcles of any Body except Salt, but impell what they meet with in Proportion to the force which impells them. Whether the corpuſcles of Water be ſo ſmall, that they can be formed into a fluid ſo thin, as to carry Matter to form and nouriſh the ſeveral Tubes of which an Hair is compoſed, or whether there be corpuſcles of different Sizes in Water, or whether there be fluids, whoſe corpuſcles are ſmaller than thoſe of Water, mixed in it, and other fluids, to which Names are given, I am not certain.

Thoſe *(Qualities)* of Oil are Fluidity and Gravity, ſome ſorts have more, and ſome leſs. But any ſort, Fluidity in a much leſs, and in moſt ſorts, Gravity in a leſſer Degree, Bulk for Bulk, than Water. However its Corpuſcles are figured, they are light, ſmall and capable of being expanded by Fire, Air, &c. but not eaſily divided or driven off in Steam, without a Of Oil conſiderable Proportion of Fire; not capable of wounding or dividing other Bodies, but of intangling with one another, and with the Corpuſcles of any ſolid Body; capable of inſinuating themſelves into the Pores of moſt Sorts of Bodies, not capable of being mixed or intangled with the Corpuſcles of any Fluid: But I think ſheaths, entangles, and contains, or admits a greater Quantity or Proportion of Corpuſcles of Fire, than any other Fluid or Body, as appears when it is fired; and from the degree of Heat it takes to make it boil.

Of Vegetable Matter.

Earthy or vegetable Matter has Gravity and Solidity, and ſome ſorts of it Elaſticity. In Maſs, ſome ſorts have more Gravity than Water, and ſome leſs, in Corpuſcles nearly the ſame; and 'tis moſt likely they are flat, thin or fibrous, framed to compoſe the Parts of our Bodies, not capable of wounding or dividing, but of adhering to one another, or to other Bodies; liable to be divided by Corpuſcles of Fire, or Salts, and ſo light as to be born along with Corpuſcles of Fire, volatile Salts, and Air.

Of Salts.

Salts have Solidity and Gravity. In Maſs, moſt Sorts have more Gravity than Water; in Corpuſcles ſome nearly the ſame. Some which are lighter than, or will ſwim, or riſe in the Air, or be elevated by the Heat of the Sun and Air, which I take to be much the ſame as Fire, but ſomething larger, becauſe Glaſs will let go Fire and hold them, and may be called volatile active Salts; and ſome which the Heat of the Sun and Air cannot move or bear off, and may be called fixed Salts. Some Sorts of them are blunt or ſheathed; others matted, or they appear to be ſo; but moſt Sorts are pointed or figured, ſo that one Sort or other, or a Mixture of ſome Sorts of them, willl divide the Corpuſcles of moſt Sorts of ſolid Bodies, ſome in the Fluid of Water, ſome in the Fluid of Air. Their Corpuſcles are liable to be divided, ſome by Fluids and ſome by Fire; they are capable of adhering to one another, and to other Bodies, and conſequently thoſe which are lighter then Air or Water, are able to make Corpuſcles of other Bodies or Fluids of greater Gravity, then the Fluid which they are contained in, ſwim in it with them; And thoſe which are heavier, to make other Corpuſcles of leſſer Gravity than the Fluid in which they are contained, ſink in it with them. Whether each ſort of Spirits be compoſed of a diſtinct Species of Corpuſcles, or they are more or leſs ſheathed, or ſheathed in different Sorts of Matter, I cannot determine. But I take what we call Spirits to be volatile Salts, ſheathed.

Of Air.

Air has Gravity, Fluidity and Elaſticity; Gravity in a leſs, and Fluidity in a greater Degree, than Water. How the Corpuſcles of Air perform their elaſtick Operation, whether each of them is formed like two Sides of a Triangle, and the Preſſure of the Atmoſphere keeps them bent at a different degree, at each different Depth of the Atmoſphere; or a greater Preſſure compreſſes them to more acute Angles, and a leſs ſuffers them to open to more oblique ones, and to form thicker or thinner Air; whether the Corpuſcles of Fire are ſo framed, as only to enter between their outſides, and expand them by their own Space, and make the whole lighter by the Difference of Gravity; or whether they alſo enter between the Legs of each Corpuſcle, and extend them in Proportion to the Force they are driven in with, and make them contain a greater Space, and ſo weigh lighter than both aſunder, by varying each other's Specific Gravities, as 'tis called, or whether the Corpuſcles of Fire can extend little Maſſes of Air like Bubbles of other Fluids, I cannot

not determine. And whether, when a Body moved in Air, receives a new force by the Air, as a Fluid preſſed after it, or by the Sort of Vacuum it makes, thoſe Corpuſcles of Air extend their Legs, and ſet it forward by their elaſtick Force; and whether theſe Jets be not the Cauſe of the ſwift Motion of Corpuſcles of Fire in it, deſerves well to by conſidered. The Corpuſcles of Air, when they are not impelled by ſome other Agent, ſeparate from all other Fluids, and collect into their Place, according to their Degree of Gravity; and will not in a Body aſcend through any other Fluid, unleſs formed into Steam by Corpuſcles of Fire and other Fluids, nor even then thro' any denſe ſolid.

Of Fire.

'Tis hard to know whether the Corpuſcles of Fire have any Gravity, or whether they adhere to one another, ſo as to form either a Fluid or ſolid Body. If they have Gravity, or are attracted towards the Center of the Sun, 'tis hard to conceive how any of them, with how great Force ſoever they are thrown, could come from thence hither. Whether they be of different Size to require different Forces to move them, and larger than thoſe which form Light, I am not certain: But the Fermentation in ſome Sorts of Wood, whilſt it is, as we call it rotting, and ſome Bodies in the ſame Condition, emit Light in the Dark, and when that Wood is ſufficiently fermented or rotten, a little Fire will conſume it, and it will emit little Light or Flame, and the Fire will appear rediſh, which induces me to believe that Light conſiſts of Corpuſcles ſmaller then Fire, or that there are Corpuſcles of Fire of different Magnitudes, or of different Gravities; however they are ſo ſmall and ſo ſharp, that they by the Preſſure of the Air pervade, and in ſufficient Quantity, divide the Corpuſcles of almoſt all Bodies, except ſome few whoſe Pores are ſo cloſe that they cannot enter in ſufficient Quantity; and ſome others, which are ſo open and their Corpuſcles ſo hooked or twiſted that they cannot divide them, pervade between and keep at a Diſtance the Corpuſcles of all Fluids, and in Quantity expand them to a great Dimenſion; and ſo light, that, adhering to the Corpuſcles of other Bodies, make thoſe which would have ſunk alone, ſwim in Water, Air, &c. and to make Corpuſcles of Water, Oil, &c. which would have ſunk, to ſwim in Air, ſo that the Air would preſs them, if alone, to its Surface. But 'tis likely they are ſo very ſmall, that as ſoon as they are freed and looſe, by the Impulſe they receive at Separation, which, as it happens, is in all Directions, the Air preſſes thoſe which fly ſideways, or downward, again to the fuel ſucceſſively, and thoſe which go upward entangle with the Matter they bear off with Air, with Particles of Moiſture or other Matter, and are detained in the Air, Water, &c. and deſcend with them to the Earth, ſo that a vaſt Quantity of them lie entangled in all ſorts of Matter, and may be freed and ſet to work by friction, fermentation, &c. And ſuppoſing a Creature alive and healthy, ſuppoſes that there is a ſufficient Quantity of theſe Corpuſcles in its Body to keep the Juices thin, fluid, and as we call it warm, ſufficient to commence a new fermentation; and the Abſence of theſe Corpuſcles is Death.

Of Cold.

Whether, what we call Cold, be only the Abſence of the Corpuſcles of Fire, whereby the Surfaces of the Corpuſcles of Fluids are ſuffered to come nearer together, and become leſs fluid or more ſolid, or whether it be Corpuſcles of Matter which can pervade the Pores or Intervals of Solids and Fluids, and entangle thoſe of Fire, and hinder their Operation, or are ſo ſhaped, that when intermixed among the Corpuſcles of Fluids, they fill the Intervals cloſer, or by Roughneſs, or &c. make them adhere together; or whether when they pervade a Veſſel full of hot Steam, they affix to the firſt Corpuſcles of Fire, and make them, and ſo they make one another ſubſide; or whether the Corpuſcles of Fire in an Inſtant pervade the Veſſel, and fly to the outſide, where there is a Vacuum for them, by Abſence of their Species, and ſo deſert the Corpuſcles of Water, &c. which they bore up, to ſubſide, I cannot tell. But if there be ſuch Corpuſcles, 'tis likely they have more Gravity than thoſe of Fire, and perhaps more than thoſe of Air, and muſt be very ſmall, and ſo ſhaped to pervade, where Air nor any other Corpuſcles except thoſe of fire, can. But whatever their figures be, they ſeem either to be blunt, or incapable of being mov'd briſkly, or ſtrongly enough to divide the Corpuſcles of other Bodies.

Of the Saliva.

Whether the Saliva or Spittle be only a thin fluid, to make the Meat break and paſs down more eaſily, ſoftened with ſome ſlimy Mixtures, to keep the Parts of the Mouth and Throat ſupple and prevent friction, or whether it have any Corpuſcles in it proper for fermentation, is not certain: But it is adapted to be vaſtly expanded by a little Heat, and that Matter, which meets the Meat and Drink in the Stomach, is doubtleſs framed for fermentation and Diviſion, and conſiſts of a Mixture of Salts and fluids; whether they have Gravity ſufficient, or how they are kept in the Stomach, when the reſt is diſcharged, or whether they ſecrete or are iſſued into the Stomach before the Meat and Drink are put in, or when they are put in, or during the time of their Diſſolution, or continually, will hereafter be conſidered.

Hence Water, Oil, earthy Matter, and Cold may be termed inactive or paſſive, and Salts, Fire and Air active.

CHAP. IV.

The Corpuſcles of ſuch different Sorts of Bodies and Fluids mixed in the Stomach and Guts, will diſſolve the Bodies in them, raiſe Steam, &c. proved by the Effects ſuch Mixtures have out of the Stomach.

THE Trunk of the Body is always filled by the Bowels and Guts, and the Stomach and Guts are more or leſs diſtended, as they are more or leſs filled by Meat, Drink, or Steam, into the Space which contains the Lungs, and as the force which extends them, or the force of the Atmoſphere prevails, the Caſe of the Belly is extended more or leſs. The more the Stomach and Guts are contracted, the more ſpace the Lungs have to play in. As the Lungs extend, they partly compreſs the ſteam in the Stomach and Guts, and partly extend the Caſe of the Belly. As the Lungs contract, the ſteam in the Stomach and Guts expands part, and the caſe of the Belly contracts part. The Liver, Milt, Kidneys, &c. are thereby by compreſſed and relaxed, of which more hereafter.

The Atmoſphere without, compreſſes the Stomach and Guts, and the Steam within, diſtends them. The Action of the Lungs, by preſſing and relaxing, moves them, when the Body is at reſt: And the Motion of the Parts in Action and the Agitation of the Body in Motion, ſhifts and renverſes the Matter in the Stomach and Guts variouſly.

When all the ſorts of Matter aforeſaid are mixed in a thick Fluid in the Stomach, there is at firſt the Preſſure of the Atmoſphere upon every Side of the Stomach, and the Gravity of the Matter, and the Elaſticity of the Air mixed in it, ſo that if the Stomach were not moved, the Particles of Matter which are lighteſt, muſt make up to the Surface, with force and ſpeed equal to theſe two Preſſures, the Elaſticity of the Air, and the force gained in their Motion. Suppoſe a Corpuſcle of Fire or volatile Salt at the Bottom, it aſcends till it meet with a Maſs of Matter, and with one of its Points ſtrikes between two or more Corpuſcles, and if their Adheſion be not too ſtrong, ſplits them, and they fly the one the one Way, and the other the other, with a force equal to the Strength of their Adheſion: The Corpuſcle purſues its Way upward by the ſame Impulſe, and if the two ſplit ones, or one of them, be either Fire, Air, or volatile Salt, it ſtrikes againſt ſome other Body, or is puſhed back by the Fluid, or begins to mount upward, and act as the other. If they be Matter as heavy as the Fluid, they attend till other Corpuſcles aſcend and ſplit them, and ſo on, till all the Corpuſcles of Fire, volatile Salts, and Air, after many Oppoſitions get to the Surface, and if there be Space there, the moſt volatile form a Steam which preſſes ſtronglier. But by the Motion of the Lungs upon the Stomach, and the Motion of the Body, the Contents of the Stomach are frequently inverted or turned topſy turvy, ſo that the lighteſt Corpuſcles are continually aſpiring and dividing the heavier, and continually turned down, and the heavier fixt Salts contribute by friction till they, by dividing the Matter infinitely ſmall, make it take up a greater Space; and by the buſtle the Corpuſcles make in flying this Way and that Way with great force, and the Elaſticity of the Air, expand the fluid in Proportion to the Quantity of the Agents, and their Agitation; ſo preſs ſtrongly againſt the Stomach, which is ſtrongly compreſſed by the Air without, and thereby the volatile Matter, as the Corpuſcles of Fire, Air, volatile Salts and Particles of the Water, Oil, and earthy matter to which they adhere, or which they can drive along with them, preſs into the upper Parts of the Guts, and thence into the lacteal Veſſels, where they only find Vent in form of Steam, and by that force drive the craſſer Matter, which will not pervade them, downwards.

If the volatile Matter were ſuffered to reſt at the Top of the Stomach, or go off freely, as it aſcends ſucceſſively, the fermentation would ſoon ceaſe, or go on very ſlowly, as it does upon the Liquor in a Guilefat unmoved. But the Motion of the Lungs and Body renews the Operation, as beating in the Liquor in an open fat does. But if fermenting Liquor be in a cloſe Veſſel, eſpecially if it be moved much, it will make the Veſſel extend, and if it get not Vent for the Steam, burſt it; if it get Vent, iſſue in Steam and Bubbles during the ferment. When in an open Veſſel, the Matter in the fluid is ſufficiently divided, and thoſe Bodies which would aſcend gone off, or ſheathed in, or adhered to, other Corpuſcles, ſo that all are divided, or balanced to near the ſame Gravity of the Fluids, ſome few Parts of the earthy or craſs Matter will leiſurely ſubſide, and ſome few of the lighter will ſwim, and the reſt be quiet; as old Ale, Wine, &c. till put into a new ferment by Motion, or ſome other Accident or Agent. Where the Corpuſcles that conſtitute the Fluid are of near the ſame Gravity, ſuch as diſtilled Spirits, &c. they cannot be put into fermentation by any Motion, nor will they diſſolve any Body immerſed in them. But the Matter in the Stomach is of various Gravities always compreſt by the Air without, and extended by Steam within, becauſe it requires a great force to drive the Steam along the Fluids in the Blood-veſſels, quite out at the Lungs and Pores. And whilſt the Lungs play, the Stomach and Guts are never ſuffered to lie one Minute ſtill, ſo nothing in it can ceaſe to ferment and emit the Steam, unleſs there be ſuch a Quantity of Matter ſo cold, or ſo incapable of being acted upon, that the Agents be overpowered.

Theſe volatile and active Salts and Corpuſcles of Fire act much the ſame Part, and after the ſame manner, upon Matter in the Fluids within the Stomach, as Fire or active Salts do upon Fuel in the Fluid of Air in a furnace. The Preſſure of the Air and of the Fluid, and the Motion of the Fluid moves, and enforces the Corpuſcles of volatile and active Salts and Fire, to act upon and divide the Bodies in the Fluid, as the Preſſure and Motion of the Air moves and enforces the Corpuſcles of Fire and active Salts, to act upon and divide the Parts of the Fuel in the Air. And Fluids beat back the Corpuſcles of Salt to the Matter, as the Air does thoſe of Fire to the Fluel. And 'tis likely that the Corpuſcles of volatile Salt, bear near the ſame Proportion of Gravity to Water, as thoſe of Fire do to Air, and as there are Fluids of different Gravities, ſo there are Salts of like different Gravities, and 'tis likely of different Sizes, to fit the Pores of different Bodies, and 'tis likely the lighteſt ſort, which I call active, and ſome of the volatile Salts, act jointly with Fire upon Fuel in the Air, as 'tis viſible they do in Sulphur, as well as thoſe of Fire act with Salts in the Fluid of Water, &c. And ſome active Salts or Spirits, when very pure, raiſe a Steam, when expoſed to the Air, nearly reſembling Flame or the Corpuſcles of fire, pure and nearly united. And the Diſſolution of Bodies by volatile Salts, &c. frees more Corpuſcles of volatile Salts, &c. as the Diſſolution of Bodies by fire frees more Corpuſcles of Fire; and thereby the Actions are encreaſed; if the Motion continue, and there be ſufficient fit Matter to work upon in Proportion to the Agents, freed Salts by their Agitation, and the Rebounds of them, and the Parts they divide, expand the Fluid containing them, in Proportion to their Motion and Agitation, as thoſe of Fire do that of Air. Salts, and Fire, and Air, bear off the ſmall Particles which adhere to them in form of ſteam from the Stomach, as fire does ſmall Parts of the Fuel, in form of Sparks or Smoke, and that Matter which is too heavy to be born off, and which the Strength of the Agents is not ſufficient to divide, ſubſide as Cinders, Aſhes, &c. do in Fire in the Fluid of Air. Air contains Corpuſcles of Fire, as Water does thoſe of Salts diffuſedly, and when ſuch a Quantity of fire or Salt is collected as to act, thoſe of the ſame ſort join, fix upon the Body, and aſſiſt, as the Air or fluid moves them thither. Corpuſcles of fire or Heat, as is moſt viſible in Rooms where there is Fire burning and People perſpiring them, are agitated, divide the Bodies in the Air, and perhaps the united

Corpuſcles of Air, and expand or adhere to the Corpuſcles of Air, &c. and make them lighter, ſo that the Preſſure of the circumjacent Air bears them up the Chimney, and freſh Air ſucceeds them, to agitate the Fire, and make its Corpuſcles move and act; and 'tis likely ſupply more Corpuſcles of fire, and perhaps with ſome nitrous or other Matter like Cold, becauſe it burns better in cold Weather than in hot. In like manner the light Matter in fluids riſes, and the ſucceeding Fluid ſupplies more Salts, &c. Thus ripe fern-ſeed, when one has ſtript them out of their Codds, and by the Preſſure of the Air, or by the Corpuſcles of Heat in it, their Skins burſt, by that force and their own Elaſticity jump up, fall down, and rebound ſo as to make a mighty Buſtle. Thus the Corpuſcles of ſome ſmall ſharp Salts called Acids, in a Fluid preſſed by the Air, inſtantly enter the Pores, ſplit, and divide the Particles of ſome other Salts, and jet the Parts each Way, and they rebound from one another, or are preſſed back by the Air ſo as to cauſe a mighty Buſtle and Exploſion, and raiſe a fume like Smoke, and a ſmall Quantity of them in the Stomach by the ſame Operation cauſe a ſudden Effervеſcence there, and ſweat all over the Body. Thus the Corpuſcles of fire, moved quickly by the Preſſure of the Air into the powdered Charcoal and Sulphur, and exciting the latent Corpuſcles of fire and volatile Salts in them mixed among the Particles of Nitre, ſuddenly ſplit them, and expand and burſt the ſmall Maſſes, and the ſplit Parts by that Preſſure, their own Elaſticity, the Elaſticity of the Air, and the Rebounds from any Thing which reſiſts their Expanſion, cauſe that terrible Exploſion, and drives them off in form of Steam or Smoke, with that infinite force and Velocity, which we ſee in fired Gunpowder, that Way where it gets Vent; and in Proportion to the Space it has for Vent, and of the Sides which reſiſt and encreaſe its force by rebounding. As the force of fire is encreaſed by being confined and rebounded on more Sides, more, ſo there be but ſufficient Room to admit the Air, and let the Smoke paſs, and the force of the Smoke which goes off is encreaſed by the Narrowneſs and Length of the flues, and by the Number of Checks in them, and the Thickneſs or Cloſeneſs of their Sides, or what defends it from the Cold, as in Gunpowder, &c. So the force of Steam raiſed from a Fluid by Corpuſcles of fire pervading the Pores of that which contains it, or by fermentation, is encreaſed by being confined and rebounded, and in its going off by the Straightneſs or Length of the Pipe, and Turns or Checks in it, and by keeping off the Cold from condenſing the Steam, as from the Stomach, &c. When we intend to burn any Thing, we eſtimate what Quantity and what ſort of fuel is neceſſary to conſume it. When we diſſolve or ferment any Thing, what Quantity and Sort of Diſſolvent or ferment is neceſſary, what Addition of other Things is neceſſary for them to work in, what previous Preparation they need, what manner they ought to be placed in, what Helps or Aſſiſtances may be given to them, in the Operations by Motion, Impulſe, Preſſure or the contraries, or if the Operation be too ſtrong, what Sort, Quantity, &c. of Matter is proper to allay it, how it is to be applied, &c. The Caſe is much the ſame in our Stomachs, and like Cauſes have like Effects there. And we ought to eat and drink Things that will be eaſily or difficultly diſſolved or born off, according to the various Degrees of Exerciſe we are to uſe, &c.

Where there is ſuch Matter as Barm in Ale, or Phlegm in the Stomach, or any other Matter of a tough fibrous Conſtitution, ſo that it can environ or encloſe

ſmall

ſmall Maſſes of fluids, &c. the Corpuſcles of Salt and fire, can expand the Maſſes of the Fluid contained in the Phlegm, extend the Fibres of the Phlegm each Way, till it form a round Bubble whoſe Sides rebound the Corpuſcles, and augment their force. As ſoon as the Bubble is of that Size, that it is lighter than the fluid, it makes upward, and ſometimes burſts in the Way, and cauſes an Exploſion, ſometimes riſes to the Top, extends vaſtly, and burſts there; after the ſame Manner in Proportion, to the Degree of Heat, as a ſmall Quantity of fluid encloſed in a Stick or Stone put into a fire is expanded, and burſts the Body which incloſes it, with a vaſt force and Noiſe, or as Ale or other fermenting Liquors burſt a cloſe Veſſel. 'Tis thus Dough riſes by ferment. 'Tis thus Soap compoſed of Salt and Oil moved in warm Water, raiſes a Lather of Bubbles. And in Proportion to the Cloſeneſs and Strength of the Phlegm, the Strength of the Agents within it is increaſed; as the force of fire is increaſed by the Strength and Cloſeneſs of the furnace; of the Barrel which encloſes fired Gunpowder; of what encloſes the Fluid in a Fire, or before the Fire, as the Skin of an Apple, the Shell of a Nut, &c.

Thus Maſſes of Phlegm in a Fluid which could never be divided by the Strokes of pointed Salts or Fire, in a Guileſat, or in the Stomach, &c. are expanded till their Sides be infinitely thin, even beyond Imagination, and are rendered capable to go off in Steam, to mix equally in the fluid, &c. * Nay even the Tubes and Bladders which compoſe fleſh, fruit, Herbs, &c. even to the moſt Minute, have Juices within each of them, which when they come into the Stomach, and are pervaded by Corpuſcles of fire, ſubtile Salts, and Spirits, expand and diſſolve the Contexture of the fibres which compoſe their ſides. Whether the ſmall Maſſes of Fluids incloſed be ſtill formed into diverſe leſſer Bubbles, and they each expand by finer Juices within them, moved by the corpuſcles of fire, as we ſee in boiling Water, or by the Inſinuation of the corpuſcles of fire between the Sides of the corpuſcles of the Fluid, or by the Springs

given

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* It is for this Purpoſe, that in us and all Animals, the Juices which help in Digeſtion are endued with a ſaponaceous Quality, as the Saliva, gaſtric Humour, pancreatick Juice; both Galls, and the Juices of all the inteſtinal Glands; aud to this chiefly that Homogeneity of Parts in Chyle and Milk, &c. is owing, which always appears in ſound Animals, tho' they are prepared from Meals made up of Things naturally, abſolutely immiſcible with each other.

given by corpuſcles divided, or by the Extenſion of corpuſcles which were bent and compreſſed; it is certain that phlegmy Liquor, or a Maſh, wherein ſmall Maſſes of fluids are ſo involved or encloſed, will bubble moſt, riſe the quickeſt and higheſt in boiling, expand ſooneſt, and moſt in fermentation, &c. And the incloſed Juices are divided into Steam before that which encloſes them, burſts. And the Stomachs and Guts that are full of Phlegm are generally moſt extended.

A Brewer's Veſſel, called a Back, containing thirty Barrels full of Liquor made of Malt, but more eſpecially of Moloſſus, which they call Waſh, and one Barrel of Barm mixed in it, will in 24 Hours begin to ferment, and ſometimes keep an Head of Barm, become warm as Milk when milked, and ſo continue for a Week. And ſometimes in 24 Hours make a break at one End, boil, roll, or move in the ſame manner, and with near the ſame Velocity as Liquor in the Salt or Allum Pans does, or this Liquor would do with a moderate fire, and will continue to roll or boil ſo for 14 Days together, and will not come to any conſiderable Degree of Warmneſs. They never beat in it, but let it take its own Courſe till it ceaſe Working, and be freed and fit to diſtill for Spirits. The Waſh of different Sorts of Malt hiſſes, and makes an extraordinary Buſtle.

So if one eat and drink 30 Ounces, one Ounce of Juices ſecreted out of the Glands into the Stomach, may be ſufficient to ferment the whole, tho' it be no ſtronger than Barm, and if the Stomach were not cloſe, nor kept ſo warm nor moved. Barm appears like Phlegm, and whether it be a phlegmy or thin Juice, or both that operates in the Stomach, and whether Phlegm will ferment Wort, deſerves to be obſerved.

The force of infinitely ſmall Agents is to be computed by their infinite Number, for that which will be lifted or ſplit by one Agent, whoſe force is equal to a Pound Weight, can be lifted or ſplit by the force of 000000 of Agents, each of whoſe force is not equal to the Part of the Weight of a Grain. And alſo by their infinite Sharpneſs, and Smallneſs, for dividing the Corpuſcles of Bodies, and by their infinite Quickneſs in repeating their Strokes.

To make this ſhort and intelligible, 'tis neceſſary to give Definitions of a few Things which are often named.

CHAP.

CHAP. V.

A Definition of Steam, and an Account of its various Qualities, Abilities, &c.

STEAM may be accounted a mixt fluid. It is a vaſt Number of ſmall Maſſes at ſmall Diſtances one from another, compoſed of Corpuſcles of Fire, or volatile Salts, or Air put into Motion by the Gravities of other Bodies or Fluids, or ſome other Impulſe joined to, ſheathed in, or entangled with Corpuſcles of other fluids or Matter ſo ſmall or light, and ſo figured, that the Maſſes or ſeveral Corpuſcles of different Matter ſo joined together, riſe thro' Fluids, ſome Diſtance into the Air, like Corpuſcles of fire mixed with thoſe of light dry Matter, which we call Sparks. When there are vaſt Numbers of ſuch ſucceſſively raiſed and hindered from aſcending upward, they may ſucceſſively by their Motion, Rebounds, and Elaſticity impell one another through the Fluid in any Direction, and jointly impell what they meet with in their Paſſage. When they come to Corpuſcles of Cold, theſe Corpuſcles adhere to the Maſſes, over-

Vid. p. 20 of Salts.

overload the Agents, and they and their Burthens fall. Their burthens collected, form a fluid, and the Agents by Degrees go off freed, with ſmaller burthens, or perhaps ſome of them lie entangled in the fluid. If theſe Agents were not framed to entangle with other Matter, 'tis likely, they are ſo ſmall, they might paſs without moving a fluid, and they move faſter or ſlower in Proportion to their burthens. Whether the Agents in each Maſs keep the ſame burthen which they take in the Stomach or Guts, and carry it through the blood to the Paſſes in the Lungs, or the capillary Veſſels, or Pores in the Skin, where the Cold clogs them, or they get out; or whether they change burthens in their Paſſage, and one take another's burthen, is not material. When theſe Agents go off alone, they are inviſible, like Corpuſcles of fire diffuſed; but when they go loaded in any conſiderable Number, near together, they form a viſible fume like Smoke. In Winter, when the Air is cool, it condenſes the Steam iſſued out of the Lungs into Maſſes ſo large that they are viſible. In Summer, when the Air is hot, it keeps them more divided, and more inviſible. * That

Steam

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* Vid. *Mart. Liſter* Diſſertat. de Humor, p, 76. *Amſtelod*, 1711.

Steam we diſcharge backward, commonly called Wind, they ſay will Fire at a Candle like the moſt volatile Spirits. When theſe Agents are entangled, or ſheathed in Matter, whoſe Corpuſcles will not divide, or not divide ſmall enough or light enough, for them to bear off, they are inactive like latent Corpuſcles of Fire, &c. That Steam which is ſo much loaded, that it goes not off briſkly we call Wind. * All Fluids, except Air, will fall through Steam, though never ſo ſtrong, and the Steam will give little Reſiſtance, but when Steam iſſues and takes its Courſe through a ſmall Tube, like a Flue to a furnace, it will reſiſt any fluid, and repell it according to the Degree of its Impulſe or ſucceſſive Motion. When the Maſſes of the Steam are kept warm in a fluid, they keep ſeparate, and inſinuate and mix themſelves in it, till the Supply ceaſe, or the fluid cool, or the Agents go off, or be overloaded. When they are condenſed alone, they form a thin Fluid. I know it is a common Notion that it is Wind or Air which extends the Stomach and Guts, but 'tis certain there can no ſuch Quantity come there at once. There doubtleſs

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* And cauſes that uneaſy Diſtenſion in the Bowels, we commonly ſay ariſes from Wind.

leſs does ſome ſmall Quantity go with our Meat and Drink, and that if collected, would make a Stop in any Paſſage of the Body, becauſe it will not pervade a Fluid alone; but when mixt with Corpuſcles of Fire, ſmall Salts, and Fluids it will paſs any fluid in any Direction. The raiſing and bearing off Corpuſcles of Solids in Steam, will not ſeem ſtrange if we conſider the ſmallneſs of the Corpuſcles of Gold that can guild the Surface of 1000 of Yards of Silver Wire; * and how much ſmaller the Corpuſcles of Vegetables, and Fluids may be. † Or if you place a burning Candle near a ſmooth Body, and between it and the Sun, when it ſhines clear, you may ſee with how great Velocity a prodigious Number of Corpuſcles iſſue from the Candle. Steam will be compreſſed or expanded, when contained in any thing which can be extended, and contracted, as its Strength, or the Strength of that which compreſſes it, prevails. And the Strength of the Steam in the Stomach and Guts, or in ſome one, or part of them, is always equal at the preſent Bent, to the Preſſure of the Atmoſphere,

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* Vid. *Boyle* Exp. de Atmoſp. Cap. 2. *Lugd. Bat.* 1676.

† Conſider the Size of a Pumpkin, in Compariſon of its Stalk, thro' which its whole Nouriſhment is conveyed.

moſphere, and the Reſiſtance of the Muſcles of the Belly, &c. becauſe theſe are always acting againſt it.

'Tis poſſible to conceive, how a Fluid in a Pipe, with ſeveral Valves, &c. might be circulated by Steam, iſſued out of a Veſſel into it, and the Compreſſure of the Air. But whether it be poſſible for Man to make the Parts ſo exact as to perform it, I cannot tell. If ſuch a Pipe had an End fixed in the Side of a Veſſel, which could be compreſſed, and would emit Steam into it, at a ſmall Aperture, and at ſome Diſtance had a Valve in it, which that Steam would force open in a Second of Time, and at a little Diſtance beyond that another Valve, to open forward alſo, and the reſt of the Pipe were filled with a Fluid, and were bended, and the other End were fixed into the Side of the Pipe, between the two Valves, immediately after the firſt, with a Valve to open into the Pipe, and the Pipe were defended from Cold, or Compreſſure between the Veſſel and the Bend, and a Valve were placed at the Bend to open forward with a ſmall Force, when the ſecond Valve opened, and beyond that Valve the Steam ſhould be condenſed by Cold, and ſuffered to perſpire by Pores, and the Pipe compreſſed by the outward Air; the Force of the Steam would drive part of the Fluid beyond the Valve at the Bend, and its force would ceaſe, and it waſte there, and the Compreſſure upon the returned Part of the Pipe, would force Part of the Fluid through the Valve at the End of the Pipe, into the Part of the Pipe between the two firſt Valves, where it would find a ſort of a Vacuum, or leſs Reſiſtance, during the firſt Part of the Second of Time, after the Steam had paſſed the Valves, and before it had Time to be iſſued in ſufficient Quantity to open the firſt Valve, and reſiſt it: and that Vacuum would be ſomewhat enlarged by the Cold in the returning fluid, which would condenſe the Steam it ſhould find there, and at the End of the Second of Time, the Steam would puſh through the firſt Valve, and Part of the Fluid, and itſelf, through the next two Valves, and beyond the Bend, ſo ſucceſſively. If the Steam were not ſecreted out of the Pipe by Pores or ſome other Way, as 'tis out of Animals by their Lungs, Pores, Ureters, &c. the Steam would encreaſe the Fluid, fill the Pipe, and hinder the Circulation.

CHAP. VI.

Concerning the Agents.

The Agents aſſigned, which circulate the Blood, ſecrete the Juices, perſpire and reſpire the Halitus, Sweat, &c. with the Reaſons for aſſigning them, confirmed by Obſervations, Reflections and Deductions.

THAT the Blood in Animals circulates, and along with it, what enters into it, through the lacteal Veſſels, till Part thereof be reſpired, perſpired, ſecreted by Urine, and Part be converted into Blood, Fleſh, Bones, &c. is now taken for granted. That it requires a very great Force to circulate it, is demonſtrable. That ſeveral, who have attempted to ſhew what circulates it, have aſcribed Powers or Faculties to Parts of our Bodies which they have not, and Actions which they are not capable of performing, few People doubt. That our Growth, Life, and Action depend upon that Circulation, or upon ſomething ſecreted out of the Blood by that Circulation, and that moſt of our Diſorders are occaſioned by, and attended with unequal, and diſorderly Circulation, is very certain. That till the Cauſe of this Circulation be known, 'tis likely the Remedies will be uncertain; and though I profeſs no Knowledge in Phyſick or Anatomy, I have employed ſome Thoughts about natural and mechanical Operations, and the allowed Apology (for the Good of Mankind) will excuſe me for offering my Thoughts upon this nice Subject, tho' they be not altogether right.

Of Diſorders.

That which is called the Circulation of the Blood, I take to be two contrary Motions, one going from the Heart along the Arteries to the extreme Parts of the Lungs, Externals, and Inteſtines, and the other returning through the Veins to the Heart. Which two Motions, I think, are performed by two different Agents, the one within the Body, and the other without the Body.

Of the Circulatiou of the Blood; and the Cauſes of it.

The firſt, I think, is performed by the Steam raiſed out of the Meat, Drink, and Juices in the Stomach and Guts; which, as it rarifies and expands, iſſues by the joint force of the Preſſure of the Atmoſphere, and its own Expanſion, from the Stomach and all Parts of the Guts, thro' the lacteal Veſſels into the *Receptaculum Chyli*, and thence through the Chyle Duct

The firſt Agent aſſigned, which drives the Blood from the Heart thro' all the Body.

into the * upper Part of the *Vena Cava*, and ſo forward through the right Ventricle of the Heart, thence into the Lungs, where the Superfluity of it is diſcharged, thence through the left Ventricle of the Heart, thence into the great Artery, thence into the leſſer Arteries, to the extreme Parts of the Body, and of the Parts which ſerve for Secretion or Diſcharge, where the Remainder of the ſaid Steam condenſes or perſpires.

The ſecond Agent which returns it to the Heart from the whole Body.

The ſecond (I think) is performed by the Preſſure of the Atmoſphere, which forces the Blood up the ſmaller Veins, into the upper and lower Parts of the *Vena Cava*, to the Place where they unite, at the right Auricle of the Heart, where the Steam iſſued at the inoſculation of the Chyle Duct, into the Subclavian Vein, which is at the upper Part of the *Vena Cava* near the Heart, takes it.

The Uſe of the Heart.

The Heart, I think, uſes not, nor has any great Force to puſh the Blood forward, but is placed for a Check or Stop: The right Auricle and Ventricle to the Steam and Blood, iſſued from the *Vena Cava*, and the left to the Blood, and Remainder of the Steam iſſued from the

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* Or thus, Into the ſubclavian Vein, and ſo to the right Auricle, hence thro' the right Ventricle, into the Lungs.

Veins in the Lungs. And its Valves are ſo contrived; thoſe, from the Veins to open inward; and thoſe, into the Arteries, to open outward, and ſhut the contrary Way: That as the Mixture of Steam and Blood preſſes out of the Veins, * it opens the Valves into each Ventricle, fills the Ventricles, extends them, opens the Valves into the Arteries, and puſhes forward, whereby the Force of the Steam behind is ſpent, ſo that the Valves from the Veins ſhut, and the Motion of the Blood in the Ventricles is continued forward, and the Heart emptied jointly by the Elaſticity of the Steam, the Compreſſion of the Atmoſphere, and the Contraction of the Muſcles of the Heart; and ſo ſucceſſively make a ſort of Space or Vacuum, in each Ventricle, at once for the Blood to flow from the Veins, and the Steam from the Guts. * And it ſeems, that the Strength of the Steam in its

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* Thro' the Auricles, it opens the Valves into each Ventricle, fills and extends them, and puſhes forward thro' the Valves of the great Artery, and thus the Blood is brought to the Heart; and it is emptied jointly by the Elaſticity of the Steam, the Compreſſion of the Atmoſphere, and the Contraction of its own muſcular Fibres; and ſo by a continual Evacuation of the Ventricles, a Sort of Vacuum or Space is found for the ſucceeding Blood and Steam, ready to pour itſelf in at the right Auricle from the *Vena Cava*, the Reſiſtance before it being removed.

common Courſe, and that of the Valves, are ſo proportioned, that the Steam which riſes in a Second of Time is neceſſary to open them, and when that, and the Blood has got Vent forward, they will ſhut, and continue ſo, till the Force of the Steam conſtantly iſſued from the Guts, and ſtopped at the Heart, in the next Second of Time, riſe to the ſame Degree. If there were not ſuch a Stop, the Steam would hurry the Blood forward, as long as its Force laſted. The Force of the Steam would always be equal, and that which it has now, would (if not ſtopped) not move the Blood a Minute; or if it were ſtrong enough to move it continually, it would move as quick as Lightning: * but by its Stops, the Force of the Steam

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* To illuſtrate this, you will find a very remarkable Paſſage in *Hippoc.* See *Lud. Duret.* Commt.in Coac. *Hipp.* Sect. 32. The learned *Boerhaave*, in his Aphor.Cap. de *Peripneumonia vera*, quotes the very Words, Numb. 848, *viz.* "If "the whole Lungs, together with the Heart, be inflamed, "the Heart falls from its Place to a Side, the Patient is "ſtruck with a Paraplegy, becomes cold and inſenſible, "and dies the ſecond or third Day." His accurate Commentator *Van Swieten*, in Tom. II. p. 767-8, endeavours to explain this Phænomenon by the received Theory, and adds, "That it ſeems wonderful *Hippocrates* ſhould be able "to make this Remark, unleſs he had known the preſent "Laws of Circulation, or had learn'd it from the Inſpection of Bodies dead of this Diſeaſe." 'Tis moſt likely he had it from the latter, for by the former it is abſolutely

Steam is encreaſed, the ſuperfluous Steam is forced to ſecrete out of the Lungs, and the Motion of the Blood is regulated to the Quantity the Cavity of the left Ven-

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ly inexplicable; or the divine old Man muſt have had a true Idea of the Cauſe of ſo rapid a Circulation, which eaſily evinces the Poſſibility of ſuch an Exit, nay, demonſtrates that no other could happen; nor would he ſo often ſurpriſe us with the Nature of his Predictions, as well as the Truth of them, if we would but conſider him in his own Senſe, and not endeavour to make our Theory his Teſt; whereas his own in moſt Points, perhaps is better; this Particular, as well as many more Symptoms in peripneumonick Caſes, as ſet down by *Hipp.* I ſay, ſhews that when the Agents of the Blood are agitated to the utmoſt, the Blood is capable even of diſplacing the Heart, which I think much eaſier to conceive, than that the Heart by its own increaſed Motion ſhall agitate the Maſs in ſuch an extraordinary manner, and even overturn itſelf. Beſides, by the reſt of the Symptoms which precede Death in this and moſt acute Diſorders, it is highly probable, nay, perhaps demonſtrable, that the left Ventricle of the Heart muſt be for ſome time, either entirely motionleſs, or at leaſt, tranſmit little or no Blood to the *Aorta*, &c. ſo the Motion of the Blood be only thro' the right to the Lungs; Vid. *Boerhaave* as above, where he ſays, Death happens to them when the Pulſe fails, and all the Parts are cold, ſave the Breaſt, Head, and Neck, which burn with Heat; the Cheeks are intenſively livid; theſe Parts now are all within the Effect of the Circulation; the reſt, which depend upon the Motion thro' the left Ventricle, are cold and benumb'd. Hence it is evident, in moſt acute Caſes the Heart is not able to withſtand the Torrent, much leſs can it with any Propriety be thought its ſole Mover.

This innate, ſelf-ſufficient Agency of the Heart, (than which nothing can be more unphiloſophical or abſurd) being a received Opinion, and taught in all Schools now a-Days, has been the only Cauſe of ſo little real Uſe having been made of the illuſtrious *Harvey*'s Motion of the tricle of the Heart ſends forth at each Puſh. Of what Uſe the Water is which environs the Heart, whether it be only to facilitate its Motion by keeping off the Preſſure of the Atmoſphere, and preventing Friction, or to condenſe the Steam at its firſt Approach, and preſerve a Vacuum till it be filled with Blood, or for what other Uſe, deſerves to be conſidered. * When the Ends of the *Vena Cava* and Heart are diſtended with Steam and Blood, the Heart will be lifted up, and when the Steam and Blood paſs thro', and the Ends of the *Vena Cava* and Heart are relaxed, the Heart will fall down,

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Blood; it hath hoodwinked us from the Beginning. Pleaſed with the Diſcovery of the Blood's Motion to and from it. We immediately dubbed this with the Name of Agent, which in reality is only a Curb upon the Agent, and had we not too ſlightly run over the great Inventor's Account, we never could have been guilty of ſo foul an Error, for he expreſly ſays the contrary, *Exercitat. Anat.* p. 191. *Lond.* 1661. and this he is induced to ſay from Exp. which he ſhall hereafter publiſh, but the Loſs of theſe Pieces are among the other irreparable ones we feel at this Day, from the Confuſion of thoſe Times. To ſee how far this great Man's *Humid and Primog.* agree with our Author's Steam, I think it worth any curious Man's Time to conſult his Book *De Generat. Animal,* p. 483. Edit. Elzev. 1641.

* When the right Auricle and Ventricle are diſtended with Steam and Blood, the Heart will be lifted up, or ſhortned, and when the Steam and Blood paſs thro', the Heart falls down, or is lengthened, beſides, &c.

down, beſides what Motion it has by being extended and contracted. As the Steam and Blood paſs along the Arteries by Puſhes, they fill and raiſe the Arteries, and in the Intervals they relax and fall down. Theſe Motions are augmented by the Expanſion of the Steam in the Heart and Arteries, where the Preſſure of the Air and Cold is moſtly kept off.

The Strength of the Air-bladders of the Lungs are ſo proportioned, that any Force, beyond what is neceſſary to drive the Blood along the Arteries, opens the Paſſages into them. And the Steam, which, if it ſhould all paſs through the left Ventricle of the Heart, would drive the Blood too faſt along the Arteries, and extend them too much, opens the Paſſages out of the Blood Veſſels, and drives Part of itſelf into theſe Bladders, and vents itſelf there. When they are a little extended, the Air preſſes in; and its Force, being augmented by Motion, extends the Lungs farther, partly into the Vacancy in the Cheſt, (if there be any) and partly into the ſpace poſſeſſed by the Stomach and Guts, and extends the Rind of the lower Belly outward. When that Air is mixed with Heat, Steam, &c. expanded and lighter than the outward Air, the

Preſſure of the outward Air upon the lower Belly, and its own Elaſticity, perhaps, aſſiſted ſomething by the Contraction of the Lungs, drives it out, and ſo it partly condenſes the Steam, and partly gives it Vent. And the Preſſure of the Air upon the lower Belly, notwithſtanding the Secretion of the Steam, and the Expanſion of the Bladders, has the ſame Effect in ſome Degree, upon the Blood in the Veins of the Lungs, as it has upon the outward Veins; and the Remainder of the Steam ſupplies its Defect, and perhaps there may be Valves upon the Veſſels, where the Blood, and Steam, or Chyle meet, and even upon the moſt capillary, where the Blood goes out of the Arteries into the Veins; but if there be, I think, they only contribute to hinder the Fluid from returning backward, and ſo direct the Force.

CHAP. VII.

The following Obſervations and Deductions, induce me to believe, that thoſe two Agents are of that Force, which is neceſſary to circulate the Blood, and that thoſe Agents employ their Force to perform that Operation.

The two Agents capable of the Powers aſcribed to them; and that they are the real ones.

THE Force of Steam, every one knows, is in Proportion to its Rarefaction or Expanſion, and if it were proved how far each ſpoonful of Liquor with a little Air, may be expanded by that Degree of Fermentation and Heat, which is in an healthful Body, it would ſeem prodigious, and the Agent, not inſufficient for the Task aſſigned. The Force of the Preſſure of the Atmoſphere is ſufficiently proved, and its Strength is certainly known, and I hope it will be allowed ſufficient for the Taſk I aſſign it, if it appear, it employs its Force therein.

'Tis evident, that ſuch a Mixture of Solids and Fluids, as is conſtantly ſupplied into our Stomachs, kept warm, and defended from the Air, as that in our ſtomachs and Guts is, and kept in Agitation, as that is by the Motion of the Lungs, Body, &c. would ferment and raiſe an hot Steam, extend the Veſſel that contained it, or if there were long ſmall Paſſages, iſſue out along them, till condenſed by the Cold. Even the Excrements after they are diſcharged, ferment in the Dunghill, grow hot, and ſend out a ſtrong Steam viſible to the Eye in cool Weather. That the Steam raiſed in the Stomach and Guts has no other Way to paſs, except when it breaks upward or downward, but through the lacteal Veſſels, and along with the Blood, by the Vent at the Lungs, out at the Pores, or, that which condenſes, at the Ureters, is alſo evident.

That the Matter, which paſſes from the Guts into the Blood, paſſes in Halitus or Steam, is viſible by the Straightneſs of the Paſſages through which it goes. That it paſſes with the Force aſſigned, is alſo demonſtrable: For, it could neither paſs through ſtraight Paſſages, nor enter into the Blood, if its Force were not greater than that which drives the Blood thro' the Veins, towards the Heart: Otherwiſe that Force would drive the Blood and the Steam back through the lacteal Veſſels into the Guts. If the Heart pumped the Blood outward, the Air muſt bring it back, or preſs upon it in returning. Hence the Force which makes the Chyle or Steam enter into the Blood, muſt be greater than the Preſſure of the Air. If the Matter which paſſes the lacteal Veſſels were more crude, or in larger Particles, it could not paſs the capillary Veſſels, nor circulate in the Blood, but would cauſe Stoppages and Swellings there. If they were much ſmaller, they would all go out at the Pores.

Steam defended from the Cold, confined, and ſucceſſively impelled and augmented with new Supplies, will riſe to a prodigious Force. But where that which confines it will be opened with a certain Force, and give it Vent, it can never riſe to be much ſtronger than that Force. I mean the Steam which iſſues with the Chyle, through the lacteal Veſſels, in a ſecond of Time, is ſufficient to open the Valves of the Heart, puſh about the Blood, and ſhift a certain Proportion into the Veſſels compreſſed by the Atmoſphere. And a Stop in the lacteal Veſſels for a ſecond of Time, would expand the Stomach and Guts, notwithſtanding the

Reſiſtance of the Air, Muſcles of the Belly, &c.

Steam that both expands the Parts, drives the Blood, and iſſues out at the Pores, muſt be ſtronger than the Air, though the expanſive or ſide-ways Motion, ſeems not to be much ſtronger, yet if a Pipe with a Fluid in the Middle, and each End empty, and the ſides too ſtrong to be compreſſed by the outward Air, were to have an Aperture of equal Dimenſion at each End, and one End fixed in a Veſſel which would emit Steam in the ſame Quantity, and with the ſame Force as the Guts, and the Air were let in at the oppoſite Aperture both at the ſame Time, the Air would puſh in with great Force, and 'tis likely prevail againſt the Steam, and puſh the Fluid forward: But the Steam ſtopped, and not condenſed, would augment its Force as more Supply iſſued, and prevail. And as the Preſſure of the Air would not encreaſe, the Steam would drive it and the Fluid, out at the Aperture where the Air came in.

The Air not a fit Agent to circulate the Blood.

The Air is not any way fit for Circulation, becauſe it would not waſte, nor condenſe, nor iſſue at the Pores, againſt its own Preſſure; ſo after the Fluid were once puſhed, the Pipe would be filled with Fluid and Air, and would ſtand ſtill, the outward and inward Force being equal. Nor would the Air mix with the Fluid, and go along with it as Steam does, but the fore-end would be full of the Fluid, and the hinder-end full of Air.

The Blood could not move without the Agents going along with it.

If the Agents that move the Blood, did not go along with the Blood, and were not extended all over the Body, there muſt be one Part, ſuppoſe the Heart, of ſufficient Strength to move all the Blood in the Body, and the Heart muſt move of itſelf, or be moved by ſome ſtronger Agent. If ſeveral Parts acted jointly, the Caſe would be the ſame.

The Steam in a healthy Man ſtronger than the Preſſure of the Atmoſphere.

I think the expanſive Force of the Steam within a Man in perfect Health, is nearly equal to, but ſomething ſtronger than the Preſſure of the Atmoſphere in fair, clear Weather; becauſe he is not ſenſible in any Part of the Preſſure of the Atmoſphere. I know the Reaſon commonly aſſigned is, becauſe it preſſes equally on all the outward Parts; but that will appear not ſufficient; for if there were not a Reſiſtance within, it would compreſs our Bellies cloſe up to our Backs, till the Strength of the Muſcles could ſtop it, or till no Space remained, but what were filled with Fluids or Solids, and it would preſs the Fluids even up to our Mouths, &c. as the additional Preſſure of Water does when one goes down to any conſiderable Depth. Whereas on the contrary, we ſee ſomething within can diſtend our Bellies to a great Degree, notwithſtanding the Reſiſtance of the Preſſure of the Air, and that of the Muſcles of the Belly, nay even againſt an additional Preſſure of ſeveral Fathoms of Water. And if the Mouth and Noſe be ſtopped, ſo that the Steam cannot iſſue out at the Lungs, notwithſtanding the Emiſſion of the Steam at the Pores, and the Preſſure of the Atmoſphere, the Parts will all extend, and ſoon put an End to Circulation and Motion. When the ſteam is very groſs, ſo that it goes off ſlowly, the Pulſe moves ſlowly; and the more 'tis pent in, the more the Guts will extend.

When the Preſſure of the outward Air is taken off an Animal in the Air-Pump, Steam diſtends, and would burſt the Body, if the Pores did not vent it. But if the Blood were circulated by the Force of the Heart, it would have no ſuch Effect: For if the Heart pumped the Blood with never ſo great Force, the Arteries muſt ſtill be full, and it could pump the Blood into them no faſter than the Veins ſupplied it, and the inward Parts, where the Force was greateſt, would be moſt extended. I believe, if an Animal had the Preſſure of the Air taken off its Body, and had Liberty to draw Air into the Lungs, and reſpire it, (if Reſpiration could be performed when the Air is kept off the Outſide,) the Steam would go a great way towards burſting the Blood-Veſſels. And I preſume, moſt of the Blood in a Creature killed in an Air-Pump, by taking out the Air, would be found in the outward Parts, and I ſhould be glad to ſee how it would, whilſt alive, and the Air was taken off, bleed at a Vein, and how at an Artery, and how when more than the ordinary Air is pumped in. And if the Preſſure of the Air were kept off the lower Belly, I ſhould be glad to ſee how the Lungs would reſpire: For I think, when the Steam within prevails, it forces a great Part of the Blood into the outward Parts, and diſtends thoſe Veſſels, and when the Preſſure of the Air or Cold prevails, they force a greater Share of the Blood into the inward Parts. And as the Lungs are ſo contrived, that they cannot emit, or vent the Steam, without Air, when the air is kept off, or hindered from entering at the Noſe or Mouth, for want of Diſcharge, the Steam prevails, diſtends the Parts, &c. ſo if the Air were kept off the Outſide of the Body, and admitted into the Lungs, and extended the Bladders, and admitted as much Steam as its Intervals could receive, * and if the Muſcles of the Lungs, and the Elaſticity of the Air filled with Steam, could ſucceſſively reſpire it, I believe the Steam would force moſt of the Blood into the Veins, and fill the Arteries with Steam, and the Blood * would not return out of the Veins to the Heart, for want of the Preſſure of the Air: For the Blood moves equally in the Veins, and is not governed by the Pulſes of the Heart, neither in its Paſſage, nor when a Vein is opened.

Abundance of Obſervations and Proofs might be made about Circulation, Reſpiration, &c. If a Man were put into a large Veſſel made cloſe of Lead or Braſs, with an Air-Pump fixed in it to draw out, or Pump in the Air, ſo long as he could endure it, and by fixing a Pipe thro' the Side, to keep cloſe in his Mouth, to draw in,

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* Or thus, If in this Condition Reſpiration could be carried on, I believe the Steam would force moſt of the Blood into the Veins, and leave the Arteries empty; and the Blood, &c.

in, and reſpire the Air. And perhaps many Diſeaſes might be cured by ſtrengthening or weakening the Preſſure of the Air, which environ'd his Body.

In Proportion to the Increaſe of the Quantity of Steam emitted from the Stomach and Guts, whether by too great a Ferment of the Juices there, as in a Fever, or by too much ſpirituous Liquor, or violent Exerciſe, the Blood moves quicker, and all the Vents, as the Lungs, Pores, &c. emit greater Quantities of that Steam; eſpecially in violent Action, the Lungs quicken their Motion, in Proportion to the Motion of the Heart, and ſlacken as that Steam abates or waſtes; and in Proportion to the Degree of Expanſion, or Quantity of the Steam, the Lungs are expanded more or leſs, and admit greater or leſſer Quantities of Air at once; and alſo admit it oftener, or ſeldomer, or quicker, or ſlower. And though you can admit and diſcharge it quicker and ſlower voluntarily, yet if you do it quicker, and do not at the ſame time uſe Action to make the Steam riſe, your Strength will ſoon be ſpent, ſo that you cannot continue it. Outward Cold ſhuts the Pores, and by preſerving, encreaſes the Force of the Steam. But if the outward Cold thicken the Juices in the Pores and capillary Veſſels too much, and ſhut them ſo cloſe, that the Steam cannot get out of the outward Parts, they will turn red and ſwell. See p. 34. And the Coolneſs of the Air contributes ſomething towards the condenſing the Steam in the Lungs, or admits a greater Quantity of Heat into its Vacancy, for otherwiſe hot Air might bring off as much Moiſture as cool Air. Nay, when the Ferment is very violent, the Steam drives too craſs Matter into the Blood, and almoſt all the liquid Part out of the Blood-Veſſels, and leaves little, but that craſs Matter there, and the grumous Part of the Blood, which cannot perſpire nor ſecrete, and a great Part of that almoſt as tough as Turpentine; ſo that it cannot paſs the capillary Veſſels, but cauſes Pain, Swelling, &c. and when the Steam is too weak, it will carry too little, and not make the Blood move faſt enough. And though we have Power to ſtop the Motion of the Lungs for a ſhort Time, and by keeping the Air in them for that Time, become ſtronger, or to uſe them for Speech, &c. yet I think the Motion of both the Lungs and the Heart are involuntary, and forced by the continual Succeſſion of the Steam. And I think, if the Stomach, or upper Part of the Guts were pricked, and ſo much of the Steam in them let out, that there ſhould not go ſufficient through the lacteal Veſſels to force the Blood, or if the Ducts for the Steam or the lacteal Veſſels, were ſtopped or cut, Circulation and Reſpiration would be that Moment at a ſtand, and the Air would preſs the greateſt Part of the Blood into the Trunk. Perhaps if the Steam preſs too hard, the Blood will not ſucceed in due Proportion. And if the Force of the Steam which drives what they call the Chyle, or indeed which drives itſelf, were not equal, or rather ſuperior, to that Force which drives the Blood from the Veins, in the outward Parts to the Heart, the Chyle and Steam could not paſs into the Blood. When I name equal Force, I ſuppoſe, to open the Valves out of the Chyle Duct into the *Vena Cava*; the Steam by being ſtopped there, and new Steam ſucceeding, muſt, though in a longer Time, be equal at certain Periods of Time, to the Force of the Blood which reſiſts, and ſhuts the Valves when it opens them. And as the Steam governs the Motion of the Blood, Nature has contrived the Cauſes which raiſe that Ferment which produces it, in ſuch a man-

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ner, that the more the Steam has to do, the more it encreaſes, and the ſtronger or ſharper it grows: For as Exerciſe waſtes the Steam, and at the ſame time requires Supplies of it, and Nouriſhment in it, it encreaſes the Fermentation in the Stomach and Guts, which ſend off thoſe Supplies. If Obſtructions in the Veſſels, or the Viſcouſneſs of the Blood hinder its going off, its Quantity and Heat being pent within, ſtill raiſes the Fermentation, and ſubtilizes or attenuates the Matter, and hinders the Excrements from going off by Stool, till the Steam remove thoſe Obſtructions, * and make the Blood move, or till ſo much of the ſharp Spirits or Salts are freed and raiſed, as to cut the Viſcouſneſs of the Blood; and as ſoon as the Steam has free Paſſage, the Fermentation by Degrees abates: If the Steam did not ſucceſſively melt, expand or thin the Blood, by mixing with it in the Arteries, as it returns cooled and thick out of the Veins, no Force whatever could circulate it, nor any craſs Matter could ever be ſecreted out of it.

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* And make a briſk Circulation. This is the true Doctrine of inciding and attenuating, for as ſoon as it has free Paſſage, &c.

How this Fermentation was at firſt ſet forward in created Man, whether this be that Breath of Life breathed into him; or whether thoſe Words meant the Soul; or what elſe, I undertake not to determine. But 'tis not difficult to conceive, how by Degrees, this Fermentation may be ſet forward in the Stomach of an Infant in the Womb: For allow it be ſupplied at the Navel, by the Blood of the Mother, ſomething muſt either paſs in at the Mouth, or be ſecreted at the Glands into the Stomach, whereby the Stomach and Guts muſt be kept diſtended, or elſe they would be found lank, and the Caſe of the Belly ſtraitened or contracted. And if there be any Thing iſſued into the Stomach, that raiſed into Steam can puſh the Blood outward, the Compreſſure of the Womb, will ſupply the Uſe of that of the Atmoſphere, to return the Blood inward. If Nature has contrived Apertures out of the Blood-Veſſels into the Stomach, 'tis likely they make Secretions into the Stomach, when the Force of the Steam grows weaker there, than the Force of the Preſſure of the Atmoſphere, whether thoſe Apertures are deſigned to ſecrete Matter thither to keep in the Fire, and preſerve Life when the Steam is moſtly ly ſpent, or the Fluids moſtly driven out, or to liquate the Meat, and digeſt it in Defect of Drink, as the Crops of Birds do to the Corn there, or to ſecrete Matter ſo craſs or ſo fibrous, that cannot be diſcharged outward, or any other Way, or to raiſe a Fermentation, or to aſſiſt in the Diſſolution of the Aliment, or to refund Matter to be farther prepared by ſeveral Operations in the Stomach, till it be fit for nouriſhing the Parts, ſupplying the neceſſary Juices, or to what other Uſes, theſe and the Secretions made into the ſeveral Parts of the Guts are deſigned, will hereafter be conſidered.

CHAP. VIII.

The Contrivance of the Frame, and Diſpoſition of the Parts of our Bodies, fitted for ſuch Motion by thoſe Agents.

THE Lungs and Heart, are caſed round with an Arch of Bones, on the upper Side, and outwardly; with the Midriff on the lower Side, inwardly; to keep off Cold, or the Preſſure of the Atmoſphere, which would ſtop all; if they could either cool or compreſs them too much. The Stomach and Guts are preſſed by the Atmoſphere without, and by the Extenſion of the Lungs, and Depreſſion of the Midriff or Diaphragm within, which aſſiſts the Force of the Steam, which iſſues out of them into the Trunk. And the Arteries which bring the Blood outward, are all defended from the Preſſure or Coolneſs of the Air, the great ones within the Trunk, the leſſer with Fleſh. The Blood mixed with Steam, runs very thin, and freely in them, becauſe it is not liable to be condenſed; and as they advance to the outward Parts, they are divided and branched ſmaller and ſmaller, ſo that the Blood comes to the Surface through infinitely ſmall, capillary Veſſels, ſo ſmall, that the Strength of the Skin is ſufficient to keep off the Preſſure and Coolneſs of the Air, and its Pores ſtop the Blood, and only ſuffers the Steam to pervade it. When the Steam has done its Office, and the Blood is admitted at ſuch like ſmall Apertures into the Veins, which lie near the Surface of the Body, it will be compreſſed by the Atmoſphere equally in all Parts, which will make the Blood flow that Way, where it meets with leaſt Reſiſtance, which is towards the Heart, becauſe each Aperture of the Valves, or Puſh of the Steam through the Heart, makes a ſort of Vacuum; and the Veins are wideſt that Way, and there is leſs Preſſure upon the Veins in the Trunk, and perhaps there may remain ſome ſmall Force of the Motion, by Puſhes outward from the Heart beyond the Returns, to further it that Way. See p. 51. The Veſſels in the higheſt Part or Head, whither the fineſt of the Steam, and the pureſt of the Blood, moſt naturally tend, and where it would in any violent Emiſſion, be in moſt Danger of burſting the capillary Veſſels, and where Nature employs the Steam the moſt, all the Senſes being ſeated there, are environed with a Caſe of Bone, to keep off the Preſſure of the Atmoſphere, and prevent thoſe Veſſels burſting outward, to prevent the Steam from perſpiring, and ſecrete it for its proper Uſes into the Nerves; and thoſe Nerves are continued along the inward Parts, and branched out as the Arteries are, where the Preſſure of the Air cannot hinder the Steam from paſſing the Nerves, whether they be Tubes, or porous by compreſſing them, or condenſing the Steam till it has extended the Muſcles, or be perſpired at the Organs of Senſe, or Pores of the Nerves. When the Steam ariſes in too great Quantity thither, or perhaps when 'tis too ſubtile; ſo that too much of it ſecretes there, all our Senſes are at a Stop, or diſordered. * The two great Diſcharges are downward, and within the Body, ſo that the Air by its Preſſure or Coolneſs can condenſe the Steam, but not hinder its Operation. The Sides of the Trunk of the Body, are compreſſed, or ſqueezed by the Air without, and the Steam in the Stomach, Guts, &c. within. And as the Air prevails, the Steam is preſſed into leſs ſpace, the Parts contracted, and the Juices are preſſed inward; as the Steam prevails, it expands, the Veſſels are extended, and the Juices are preſſed outward. Every Part or Member of the Body, conſiſting of Bone environed with Fleſh, and Skin, compoſed of Arteries, Veins, hollow Tubes, is preſſed by the Air without againſt the Bone, and by the Steam in the Arteries, Veins and Tubes, as it circulates the Blood and Juices, by its expanſive Force, or ſideways Motion againſt the Bone inward, and againſt the Air outward. The Inſides of

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* Perſpiration which is generally looked upon as the moſt conſiderable Diſcharge, is by our Author all along underſtood by the Evacuation of the overplus Steam, and then there are only the two great Diſcharges remaining.

of the Trunk, and Outſides of the Stomach, Guts, Liver, Milt, Kidneys, Midriff, Caul, Meſentery, and Bladder, &c. are compreſſed one againſt another, by the Steam within and Air without; and their Out-Coats are ſo cloſe, that in healthy Perſons they either emit nothing, or what one emits, others admit. When the Steam extends the Stomach and Guts in all Parts, little is returned into any of them. But when the Steam in any Part between ſtop and ſtop, or Valve and Valve is waſted, the Valves ſhut, the Part contracts, and the Steam iſſues from the other Parts; Juices are preſſed by the Air and Steam, into the Glands in that Part, to be ready to iſſue into it to begin a new Ferment, or, &c. That the inward Parts always fill the Cavities of the upper and lower Diviſion in the Trunk, and preſs againſt one another, with as great, or a greater Preſſure, than that of the Air, is evident; for conſidering how pliable or flexible the Guts full of Fluids and Steam are, when there is a ſmall Aperture made in the Caſe or Rind of the lower Belly, they could not puſh out, if there were any Space void within, and if that which expands them were not ſtronger than the Preſſure of the Air: And when the Lungs expand, preſs the Guts, and by them extend the Rind of the Belly, if there were any void Space they would preſs into it, before they could ſtretch the lower Belly againſt the Strength of its Muſcles, and the Preſſure of the Air. Nor could the Preſſure of the Air upon the lower Belly, preſs back the Lungs into their firſt Space, ſo long as there were any ſpace empty in the lower Diviſion, and the Steam has the like expanſive Force in Proportion to its Quantity, in every Artery or Tube in the Body; ſo that every one, ſtrong or weak, is ſupported by the others next adjoining, from extending out of Courſe, or burſting. If more Ribs, or a Caſe or Frame of Bones, had included or environed the lower Belly, the Circulation of the Blood, and the Vibration of the Lungs, could neither of them have been performed; for the Steam muſt continually have been ſo ſtrong, as to have kept the Place allowed it, in the Caſe full; and preſſed the reſt with Force equal to the Preſſure of the Air, and its own expanſive Force, that is, ſo much above the common Preſſure or Reſiſtance of the Air upon the Blood-Veſſels, as ſhould have been ſufficient

This is evident in all Ruptures.

cient to have overcome that Force, and have circulated the Blood, which would have prevented any Blood from entering into the Inteſtines, and then the Stomach and Guts could not have been moved by the Lungs, nor have emptied and diſcharged the Excrements, nor could the Lungs have had Liberty to vibrate in. But by the Pliableneſs of the lower Belly, the Lungs play, and the Stomach and Guts are moved, and kept compreſſed cloſe, according to the different Extents of the Steam. And the Preſſure, the Air has at each Time, lies equally upon the Stomach and Guts, to aſſiſt in driving the Steam, as lies upon the Blood Veſſels to obſtruct its Circulation, and the expanſive Force of the Steam caſts the balance, and moves the Blood faſter or ſlower, in Proportion to the Difference of its Strength, &c.

There is a twofold Force, or two Forces joined, which act in driving and preſſing the Steam out of the Stomach and Guts, and but one of thoſe Forces in obſtructing it, and the Blood, which it drives; and that much leſſened by the expanſive Power of the Steam in the Arteries and Veins, whereby the Blood is not only thinned, but thoſe Veſſels or

Pipes kept open, or their Sides extended outward, without obſtructing the Blood, which Air, nor no other Agent could do. This eludes all the Computations which have been made of the Reſiſtance by the Preſſure of the Air upon the Body, and the Friction the Blood and Juices ſuffer, and the Stops and Interruptions they meet with by Valves, Strainers, &c. in the Blood-veſſels. The Power of this expanſive Force of Steam, has been proved to be very great in other Inſtances, but has never been computed or meaſured in the Stomach, nor have I had ſufficient Opportunity to do it, neither to compute what Force Steam has upon warm Fluids, nor what Force it would have to be iſſued at one Aperture of a certain Diameter; nor as it is iſſued at infinite Numbers of ſmall ones, neither ſingly, by its own expanſive Force, without being compreſſed by the Air, nor jointly by that Force and the Compreſſure of the Atmoſphere, ſo as to aſcertain the force which is neceſſary to circulate the Blood, &c. The lacteal Veſſels, Chyle Ducts, &c. through which the Steam paſſes to the Heart, are made fibrous, tough, and capable of being extended, and have Liberty, when the Steam is ſtrong to extend. The Arteries,

teries, through which the Blood paſſes by Jirks, and which are moſtly encloſed in ſolid Parts, are made of ſuch a Texture that they cannot extend much, becauſe that would evade the Force in the Motion of the Blood forward, and alſo incommode the ſolid Parts. The Veins are made capable of being extended, and afford a greater Space for the Blood when it is expanded, which they being placed in the extreme Parts, moſtly near the Surface, can do without Damage. Whether the Steam iſſues out into the lacteal Veſſels in the ſame Manner as Water enters into the Bladder between the Coats, or thoſe Veſſels are placed in the Sides of the Guts; ſo that when the Steam is very ſtrong, the Sides of the Guts may be extended, and the Inlets to the lacteal Veſſels ſtraightned, I am not certain.

There is never any Vacancy within, but what is filled with Solids, Fluids, or Steam, and the ſide of each Veſſel preſſes upon the next, as when the Lungs are contracted, the Guts, Midriff and Bowels follow cloſe, compreſs the Lungs, Midriff, and one another, as well when they are empty, or moving to and fro, as when they are extended, though not quite ſo much. The Caſe of the Breaſt and the Midriff, keep the Lungs from extending too far, or burſting, and makes them move the Stomach and Guts. The Liver lies on the right Side, I think, one Lobe on each ſide of the Stomach, and the Milt on the left Side; ſo the Stomach and Guts, when they are extended above the common Preſſure of the Air, which returns the Blood from the lower Parts through the Liver, will compreſs the Liver and Milt. The Heart as well as the reſt is compreſſed, and moves moſtly in the Fluid that invirons it, and that Compreſſure aſſiſts the Extenſion of its Muſcles to contract, and help to empty the Ventricles, as the like does in returning the Blood out of the Lungs, diſcharging the Breath, &c. and the inward Parts are not only limited from extending out of Courſe, but fixed by Ligaments from ſhifting out of their Places. When any of the inward Parts, the Stomach, Guts, lacteal Veſſels, or Ducts, are extended by the Strength of the Steam; the Steam if it paſſes freely, alſo extends the next adjicent Veſſels and parts with the ſame Force, and their Sides ſupport one another, ſo that the weakeſt cannot be ſtrained, except in an extraordinary Effort of Paſſion before the Steam get Vent, and as ſoon as it gets Vent, they are all ſafe. If the Reſiſtance on the Sides of the ſmall Tubes were taken off, ſuch as the lacteal Veſſels, &c. the inward Force would burſt them. But as they all ſupport one another with the ſame Force, they cannot extend out of compaſs, except in Fits, when the Steam vents not at the Lungs; * and when the Force that extends the Stomach and Guts, and drives the blood outward, is greater than the Preſſure of the Air, the blood will not return faſt enough, and the outward Veſſels will be filled, and the Liver, &c. within, through which the blood returns, will be compreſſed. But the Stomach and Guts ſeldom extend very much, when the Steam drives the blood very briſkly; becauſe the Steam is then not too craſs, ſo this can ſeldom happen except in violent Action, and perhaps the blood is moſt wanted without, then. The ſolid, or fibrous Parts or Veſſels, which compoſe the body, have no Qualities in them, tending towards Motion, but Gravity, and perhaps not that neither; and are only moved, bended, contracted, or extended by the Motion of the Fluids; except when ſome of

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* Doth not this ſeem to account for the Jaundice, which often follows convulſive and hyſterical Diſorders?

of them are bended, they tend towards their former Figure by a ſmall Degree of Elaſticity, and what we aſcribe to that, is frequently performed by Impulſe from the Fluids within or adjoining. Nor have the Fluids, whoſe Corpuſcles are of equal Gravity, and like Figure, and have like Qualities, which do not ferment, or are not expanded, nor have Elaſticity, any Qualities in them, tending towards Motion, but Gravity, and it is not certain that Gravity is inherent. There ſeems to be ſeveral Ways, whereby the Fluids move the ſolid Parts: Firſt, the Parts wherein the Aliment is fermented, whoſe Sides are extended each, as the Ferment prevails againſt the Preſſure of the Air without, and contracted as the Ferment abates, or is overcome by the Preſſure of the Air. And there are Tubes and Ligaments framed in the Sides of thoſe Parts, which are filled with Blood or Juices by Degrees, as the Reſiſtance within abates, and keep the Cavity of the Veſſel leſſened, and the Sides contracted, till the Ferment encreaſe again in that Part, and the Juices be by Degrees diſcharged out of thoſe ſmall Tubes: And thoſe Tubes and Ligaments have appeared, as if they had been the Agents which contracted, or ex-

Motion falſly aſcrib'd to the ſolid Parts.

tended the Part; and there are ſuch like Tubes in the Sides of the Blood-veſſels, which when the Force which drives the blood is abated in any Part, fill and contract the Veſſels in that Part, and keep them at that Extent, and empty when the Force is encreaſed there, and ſo ſeem as if they ſtraightned or widened thoſe Veſſels by their own Power: ſo of the Lungs, and ſeveral other Parts, which are all performed by the Powers of Steam and Air, as each prevail upon, or in each Part, but moſt viſibly in the Heart. Secondly, where ſome Parts are ſo compoſed of Tubes or bladders fixed to a Ligament, which, at the other End is fixed to a ſolid Part, that extending the bladders, ſhortens them, and draws the ſolid Part by the Ligament fixed to it, which is called voluntary Motion. Branches from the Arteries fill the Inteſtines, Muſcles, &c. and branches of the Nerves fill them, with Steam from within, and branches from the Veins, fill them by the Preſſure of the Air from without. The Force of the Steam muſt act upon the Arteries and Nerves outward, and the Preſſure of the Air upon the Veins inward. The Action and Strength of the Muſcles is compounded of the expanſive

Force and Strength of the Steam, which by the Arteries or Nerves, fill the Veſſels which compoſe them within; and of the Compreſſure of the Atmoſphere, which compreſſes and binds up the Outſides, and forces the blood and Juices inward, from the Veins and Glands, into the Veſſels which compoſe them. * The Steam fills the Muſcles, and by extending the bladders contracts the Part, then empties that Steam into the diſtending Muſcles, or lets it go off, and fills the diſtending Muſcle with other Steam, and the Air preſſes them to their firſt Figure when they are emptied. The Muſcles are guarded by the Compreſſure of the Atmoſphere from extending too far, or burſting, which they would be liable to, if it were taken off, and doubtleſs there are Veſſels or Coats compoſed of ſmall Veſſels, which are filled with Juices by the Preſſure of the Air, to reſiſt and keep them from extending their bounds. The blood is not only of proper Conſiſtence to be driven by the Steam, to convey Nouriſhment to each Part, to afford an infinite Number of various ſorts of Juices,

for

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* Some Experiments about particular Effluvia from animal Bodies, ſeem to encourage this Hypotheſis, and make it deſerve a nicer Enquiry.

for the ſeveral Uſes for each Part, and that fine Steam, they call Spirits, for the Uſe of the Nerves, to diſcharge the ſuperfluous Parts at the Lungs, Pores, by Urine, &c. but perhaps alſo an Atmoſphere for the Steam to work with, to extend the Parts by Exploſion, as Fire does with Water; in the large Parts with common Blood, in the leſſer Parts, the ſeveral Degrees of Juices ſecreted out of it. The Size, Number, or Thickneſs of the Muſcles or Fibres, wherein it was ſuppoſed Strength for Motion conſiſted, is proportioned to the Strength of the Steam, and Juices neceſſary to contract, or draw the Parts which they are to act upon, or to reſiſt the Force of the Steam, within the Part from extending too far, &c. theſe Parts have no active Power nor Force in themſelves, ſo their Strength cannot be greater or leſs, by being either ſmall or large, only where the Sides of a Tube, or Veſſel, or Part is compoſed of a great Number of ſmaller Veſſels, it is intended to contract forcibly. Every Tube in the Body which compoſes the Sides of any of the inward Veſſels, that is, ſuch as the Steam extends outward, is extended by the Fluids preſſed into it by the outward Air, and by that means the Tubes which compoſe the Sides of the Heart, are continually kept full and extended by the Fluids ſo preſſed into them; thence the Heart by the vaſt number of Tubes, arterial, venial, and muſcular in its thick Sides, has continually a contractive Force, and would always remain ſtrongly contracted, or with its Apertures cloſed, and its Sides together, if the force of the Steam did not alternately open it, and as that Strength is ſpent, it contracts: The Power or Force of the Contraction by the Preſſure of the Air, is encreaſed by the Number of the Tubes or Veſſels which compoſe the Sides of an inward Veſſel, as well as its Cavity is more ſtraightened by their Numbers being extended, by which means the ſeveral Juices, as Gall, pancreatick, &c. are preſſed out. *Qu.* When the Reſiſtance is weak within, and the ſolid Parts be moved, as I imagine, by theſe Agents, and after theſe Manners, will not this alſo clear the Uſes of the ſeveral Parts, make Anatomy plain? Quit the Anatomiſts of ſeeking for ſolid Parts, to perform Motions which Fluids perform? for Muſcles to open where the Part is only to contract? and to contract where they are only to open? and of that inſuperable Difficulty, that the force given by Muſcles to the Heart, Brain, or any other Part, ſhall move all the other Parts and itſelf? *

Lateral or ſide Paſſages for the Agents neceſſary.

As the Arteries are branched out ſmaller and ſmaller from the Heart, and the Steam drives the Blood outward, the force of the blood iſſued out of an Artery into a Muſcle, or Part to be extended from within, cannot be greater in Proportion to the Wideneſs of the Artery, than the Force with which it iſſues out at the Ends of the Arteries into the Veins at that Diſtance. And as the Veins from many ſmall branches are collected into one before they reach the Heart, the force of the blood iſſued out of a Vein, to extend any Part or Muſcle inward by the Preſſure of the Air, cannot be greater, than the Stop it

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* Among their imaginary Agents, there is one the moſt abſurd of all, that is, the Contraction of the *Dura Mater*, this is called by *Hoffman* the Occaſion of all convulſive Diſorders; how this can poſſibly contract itſelf, I only appeal to any Body who has open'd the Head of a dead Perſon; for he muſt know its Adheſion to the Skull, even at the Top to be ſo ſtrong as hardly to let the Skull be ſeparated from it, and at the Bottom in the Inequality, to adhere ſo cloſe, as to require the greateſt Difficulty to ſeparate it; but when an Hypotheſis is to be ſupported, I am ſorry to ſay it, it ſeems as if very little Regard were had to the Truth and Firmneſs of its Foundation, which in Phyſick muſt often be of very fatal Conſequence; and I fancy every Body will condemn *Ludere cum Corio humano*, as well as *Ludere cum ſacris*.

it meets with at its entring into the Heart, which is a full Stop, and an Outlet alternately; ſo there muſt be ſome ſide-way Veſſels out of each into different Sets of Muſcles, upon which theſe two Forces muſt act oppoſitely, or alternately; and 'tis likely there are Outlets out of the Nerves, through which the Steam iſſues, into each, or between the two, and acts upon the blood and Juices emitted into thoſe Muſcles, and either expands thoſe Fluids, or inflates the infinite Numbers of ſmall bladders, without venting, otherwiſe than by the Will, or ſlowly. Whether the Muſcles are kept gently extended with Steam by the Nerves, and the blood be iſſued into it, or they be kept gently extended by the blood, and the Steam be iſſued into the blood, has not been clearly obſerved.

CHAP. IX.

Voluntary Motion, though not directed, yet perform'd by the ſame Agents.

Animal Spirits and Steam the ſame thing.

PEOPLE aſcribe all the voluntary Operations of the body to ſomething they call animal Spirits, I ſuppoſe they mean infinitely ſmall Particles of Matter, ſuch as can in an Inſtant pervade the blood, and paſs along the Veſſels from one Part to another. I confeſs I have no Notion of any other Spirits beſides this Steam, which, I ſuppoſe, conſiſts of Fire, Spirits, Salt, Air, Water, &c. That Degree of Heat, or the Corpuſcles of Fire diffuſed at that Diſtance they are in our bodies, if they did not entangle with the Corpuſcles of the Fluids, &c. in our bodies could contribute very little towards the Motion of blood or parts; becauſe they would, immediately in Action, pervade all the Parts of our bodies, if they were much more bulky and ſolid than they are, and fly off. If the Corpuſcles of the Agent, which extends the Muſcles, were as ſmall as thoſe of Fire, they would pervade the Sides of the Tubes; if as ſharp as thoſe of Salts, they would wound and cut the Parts, conſidering with what vaſt Force they are compreſſed: but ſmall Maſſes compoſed of Corpuſcles of Fire, adhering to Corpuſcles of fine fluids, will pervade the fluids, but neither pervade or wound the Tubes. If any other Spirits did ſubſiſt in our bodies, they muſt continually have ſomething to impell or force them to extend the Muſcles in the different Parts of the body: There muſt be a Part of equal force, to move each other Part, from the Head, or wherever you begin, and a Part there, ſtrong enough to move them all, and the laſt muſt be moved by a ſtronger Agent, or move itſelf; whereas we ſee no other Part concerned to move a Finger, but the Muſcles and Parts which belong to it. Beſides, conſidering thoſe Spirits muſt be expanded, they muſt continually go off in a vaſt Quantity at the Pores, by the Lungs, &c. and muſt continually be ſupply'd by nearly the ſame Quantity; and I believe it will be hard to aſſign any other Riſe from whence they can have their Supply or Impulſe: Allow they were moved from Part to Part, by ſome Agent which we cannot comprehend, which they call the Mind or Will, can any one conceive, how Matter ſo ſmall and ſo volatile, moved ſo forcibly, frequently, in all the Parts of our Bodies at once for a long Time, ſhould not get off at the Lungs and Pores, when they are ſo open by Heat or Action, that even a Cloud flies out viſibly, ſufficient to fill all the Space in one of our Bodies in a very ſhort time; nay, even to fill a little cloſe Room, ſo as almoſt to ſtifle one. If voluntary Motion, be performed by Steam iſſued out of the Blood, and that Steam go off in ſuch Quantity, 'tis neceſſary that the Motion of the Blood ſhould be ſo extremely quick as it is, and that it ſhould be quickened in proportion to the Expence of the Steam, which Action ſupplies freſh Steam as above.

No reaſon for making the Mind an Agent.

I ſhall not endeavour to attribute any of the Operations of the Mind to Matter; but we find as far as we have yet reached, that God has ſo ordered Things in the inanimate World, that Matter moves Matter by the natural Qualities wherewith he has endued each Species of it, and by the ſhorteſt plaineſt Ways. And if theſe Agents can move the Blood and Parts of the Body according to the natural Laws of Matter, the Body will appear a more perfect regular Machine, and more ſimple. And if the Strength of each Animal be augmented and diminiſhed in Proportion to the Supplies and Expence of this Steam, perhaps it may be poſſible to ſhew, that this Steam is the Agent which moves the Parts of our Body, as well voluntary as involuntary, and after what Manner it moves them: for I think it will be more eaſy to demonſtrate how this Steam, which conſtantly fills all the Arteries and Nerves, may extend and contract the Muſcles, &c. with the Aſſiſtance of the Atmoſphere, than any Agent yet aſſigned. The Obſtruction of the Steam in any of the Muſcles, diſables them from extending and contracting, and conſequently from moving the Part aſſigned them. When the Steam is too ſharp or full of Salts, it wounds the Muſcles, and makes them ſore, &c. And 'tis likely when they are too moiſt and precipitate, or are condenſed by Cold in the Muſcles, they cauſe Rheumatiſms, and Palſies.

The Mind has a Power of directing our Operations, and what Power.

That our Mind has Power to direct the Operation of all our Parts, to which Providence has given that we call voluntary Motion, is evident; and 'tis alſo evident, that the Force of that Operation, is limited in Proportion to the Quantity or Fineneſs of the Agent, the Freedom or Obſtruction it meets with in the Paſſages, and the different Contrivance of the Muſcles and Parts upon which it acts, and whether there be any other Share of the Operation performed by the Mind, when it would iſſue the Agent, which I ſuppoſe to be Steam, to one Part, than ſhutting the Valves or Paſſages to other Parts, and permitting that Steam to iſſue into the Muſcles which are to be contracted, or opening the Valves, and letting it, out of thoſe Muſcles which are to be diſtended, and into others which are to be contracted, to expand them, and perform the Action, I very much doubt. 'Tis certain we are ſtronger when we have uſed Action to raiſe the Steam, than we are when we are beginning, or at the firſt Starting from Reſt. And when one lifts a great Weight, as much as one poſſibly can, one forcibly contracts the Muſcles of one's Belly, and keeps one's Lungs full or diſtended with Air, to ſqueeze out the Steam, and give Strength to the Parts; and as ſoon as one ſuffers the Muſcles of one's Belly to relax, or the Air to reſpire out of one's Lungs, one loſes Strength, and the Weight will fall. Waggon-Horſes ſometimes in drawing compreſs the Steam within, and ſtretch the outward Parts ſo much by the Steam, that it will puſh the Eyes out of their Heads.

CHAP. X.

Some Thoughts about the Manner of Senſation.

PEOPLE talk of Spirits iſſued from the Brain along the Nerves, which perform abundance of Operations. Indeed there is a great Share of Blood circulates through the Head, and the Steam circulating with the Blood into the Head, has not the ſame Space for, nor the ſame Proportion of Pores to diſcharge it there, as it has at the other extreme Parts, becauſe the Skull covers them, and it can only iſſue out at the Pores in the Ears, Eyes, Mouth, or Noſe, which if it do in ſo much greater Proportion, may eaſily be diſcovered by applying a poliſhed Glaſs: If it do not, it muſt be circulated along with the Blood, or ſecreted into other Veſſels there: but if the Paſſages to the Nerves take their Roots here, perhaps the Steam which is prevented from being diſcharged by the Skull, may be ſeparated by the Veſſels, Brains, &c. from the blood, and iſſued along the Nerves, and employed there to their proper Uſes. And I believe any Organ or Part, through which

Steam does not paſs, or through which it does not paſs in due Proportion, does not convey any Senſe at all, or but a very faint or confuſed one. If this be ſo, I confeſs 'tis ſufficient to make me doubtful, whether our Senſes be not occaſioned by the various Interruptions of the various ſorts of Steam, iſſued from the different Parts or Organs of our Bodies, which makes one another rebound backward to their firſt Source; as when you touch any Part, the Steam iſſuing is ſtopt, and muſt rebound and repulſe other Steam ſucceſſively backward from the Part touched along the ſmall Nerves, up the great Nerve to the Brain, and they muſt have Senſe all along, to diſtinguiſh each Part. Nay, may not the Eye iſſue Steam as ſmall as Light, and that Steam be put into as quick Motion, and it put the intermediate Light into as quick Motion as we can conceive any reflected Light can be? For I ſuppoſe, they mean not that the immediate Corpuſcles of Light which ſtrike upon, and reflect from the Object, are reflected to the Eye, but that they move others, and they ſtill others ſucceſſively, till thoſe moved next the Eye, ſtrike it; and if the Steam iſſued at the Eye can puſh the Light againſt the Object,

ject, it will rebound againſt the Eye: And is it not more eaſy to conceive, how a Stream of Light iſſuing or moved from a Point to a Plain, may be equally interrupted, and cauſe Rebounds or Interruptions of all the ſucceeding Steam and Light in Motion, either to the naked Eye, or through Glaſſes or Teleſcopes, than how Bodies reflected from a Plain can center in a Point, or in any Point? 'Tis eaſy to conceive, how they might rebound from a Concave to a certain Point, and but to only one Point. If there be an Emiſſion of Steam, may not it form as many or more Senſations or Ideas than the other can? And Fermentation can emit Light out of rotten Wood, and out of Animals, as ſome Part of the Gloworm, they ſay, out of the Back of a Cat when rubbed in the Dark *. Nay, what is more to the Purpoſe, out of the Eyes of ſeveral Creatures in the Dark, where Glaſs or any Body more poliſhed and capable of reflecting, than their Eyes, will reflect none. Nay, Light reflected from a poliſhed Diamond or Glaſs, of the Bigneſs of an Eye, ſtrikes not one's Eye with a Quarter of that Force which the Light

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* Inſtances where what iſſues out of the Eye makes the Creature ſee in the Dark. *Derham*, p. 122.

Light from another clear Eye does, which is ſuppoſed to admit the Light, but I ſuppoſe, emits it. I ſuppoſe they mean by Nerves, ſmall, hollow, or porous Tubes, branched from the great Nerves which go from the Brain, or from the Brain itſelf, to the ſeveral Parts of the Head and Body, filled with what they call animal Spirits: Do thoſe Spirits ſtagnate, or do they perſpire at the Out-ends of the Nerves? or do they circulate from the Brain in ſome of the Tubes, and return thither in others? Is the Senſe of Touching, &c. conveyed to the Brain by the Parts of the Tubes, or by what is contained in them? If by that contained in them, is it by touching the ſtagnant Spirits, or by ſtopping the Perſpiration or Circulation of them, and making the Spirits rebound back to the Brain, or does the touching of the returning Spirits convey the Senſe of the Touch of the Brain? If there be ſuch Tubes, and the Senſe of Touching be conveyed to the Brain by them, they muſt be branched to the moſt minute Parts of the Body: And the Spirits in the Nerves cannot circulate, becauſe there is but one great Tube or Nerve from the Brain to each Part, and no other that returns to it; or, as one may ſay, the Brain is branched out to every Part of the Body in Tubes attending the Arteries, and if the Spirits circulate not in them, they muſt perſpire or be diſcharged at the Ends, otherwiſe they would be ſtagnant, and would need no new Supplies. Such a Degree of Cold as condenſes the Steam in the outward Ends of the Nerves, or in the Muſcles, takes away the Senſe of Feeling, and almoſt the Power of Motion. What Effects different ſorts of Steam, different Quantities, ſecreted or diſcharged at different Seaſons, &c. may have upon the Nerves deſerve to be traced, and nicely conſidered. That what I call Steam will be ſecreted into thoſe Tubes is plain, and that there never is any Subſtance or Fluid found in them is certain, and it ſeems not neceſſary that they ſhould be ſo large, to convey the Senſe of touching to the Brain: And they are more likely than the Arteries, or any other Tubes, to have Outlets to the Muſcles to convey the Steam which extends and contracts them alternately. Steam affects our Bodies with that Senſation, which Heat produces in Proportion to the Quantity of Corpuſcles of Fire, or volatile Salts in it; When they are in too great Proportion, they can divide the Parts, &c.

When in a due Proportion, it makes our Bodies warm, and it may riſe with great Force by Fermentation, when loaded with proper Fluids, without affecting our Bodies with any conſiderable Degree of Heat.

CHAP. XI.

The Sides of the greater Tubes, as Guts, Arteries, Veins, &c. compoſed of leſſer Tubes, their Diſpoſitions, and Uſes.

AS all the greater Tubes in the Body, ſuch as Arteries, Veins, Ducts, Glands, &c. muſt be compoſed of ſtill leſſer in Proportion with the Mouths of the ſmalleſt in each inward, or into the Inſide of the Tubes, till their Ends terminate at the capillary Glands outward, or into the Stomach, Guts, &c. inward; they muſt receive Juices ſtill thinner and thinner out of the Blood, and ſecrete them into it again, or diſcharge them outward or inward, and filling the ſmaller Veſſels in the Sides, muſt contract and ſtraighten, and diſcharging or emptying them, lengthen and widen the Tubes they compoſe; iſſuing the Juices into the ſmaller, thicken the Blood, and ſecreting them into the greater Blood-veſſels thin it, &c. And they muſt be directed by the ſame Agents and Cauſes: At what Times, and for what Uſes, deſerves to be nicely obſerved, and well conſidered, as well in the Lungs, Liver, Milt, Kidneys, &c. as in the outward Parts of the Body; but more particularly in the Sides of the Stomach and Guts, becauſe their Effects ſeem to be of greater Conſequence here. 'Tis eaſier to conceive than deſcribe, how filling or emptying ſmall Tubes which compoſe the Sides of a larger Tube, ſtraightens or widens it. If there be ſo many ſmall Tubes parallel and touching with their Sides, that they can be filled and extended into Circles, and emptied ſo, that their Sides may meet when they are empty, the Circumference of the great Tube will be near half the Length of the Circumferences of all the leſſer ones; when the leſſer Tubes are full, the Circumference of the great Tube, through the Centres of the leſſer ones, will be but about one third of the Circumferences of all the leſſer Tubes, and almoſt half of each leſſer Tube, and of the Fluid in each of them, will be within that Circumference. If the leſſer Tubes be ſo wide or ſo few, that they cannot be extended into Circles when they are filled, but fill the great Tube, their Outſides will form half Arches, and their Inſides Triangles, each with a Point at the Centre of the great Tube. If there be many Rows of the leſſer Tubes, which compoſe the Sides of the greater, of different Sizes, or in different Poſitions, ſome parallel to the great Tube, ſome environing it, ſome diagonal to them, &c. emptying or filling; the leſſer will widen or ſtraighten, lengthen or ſhorten, open or ſhut the great Tube in the Manner aforeſaid, and thoſe twined about will compreſs the reſt after the ſame Manner. If there be ſeveral Folds of Skin compoſed of hollow Tubes or Bladders, round the Inſides of any Part of the Guts, &c. of ſufficient Size or Capacity, 'tis plain, that when thoſe Veſſels or Glands in Tubes, or Branches of Tubes are full, they will meet, fill up the Gut, or, &c. ply into the Folds of one another, and form a Valve or Stop; and when the Juice is diſcharged, and the Blood repelled out of them, theſe Veſſels, Glands, &c. will fall down by the Sides of the Guts, or, &c. in Form of thin empty Skins, and make an open Paſſage. The Valves in the Blood-Veſſels, which only open one

Way, and are kept ſhut when the Force on the Outſide is ſtrongeſt, and are open'd when the Force on the Inſide is ſtrongeſt, need be of no other Figure than thoſe of Caulids in a Pump, and need no filling or emptying of the ſmall Veſſels, but only to be bended forward and backward, ſo as to open and ſhut them.

CHAP. XII.

A Deſcription of the Ducts, &c. for ſecreting, and the Glands for collecting and diſcharging Juices out of the Blood.

GLands are a Congeries of ſmall Veſſels, contrived to collect and diſcharge, the neceſſary Quantities of the ſeveral Sorts of Juices, which jointly we call Blood out of the Veſſels in which it circulates. The Blood in a healthy Perſon ſhould be compoſed of ſuch a Mixture of Juices, that together they may not be too craſs to paſs the ſmalleſt Blood-veſſels, nor too thin to let the Steam pervade them without circulating them; and of a ſufficient Proportion of Corpuſcles of each Sort and Size, neceſſary to be ſecreted to the ſeveral Uſes, in the ſeveral Parts of the Body; and they ſhould by Steam and Action be kept ſo divided, and hindered from precipitating, ſtagnating, or coagulating; that as ſome are fixed to the Parts, ſecreted or born off, others of the ſame Kind, ſhould be ſupplied by the Steam, by that animal Proceſs from the Aliment in the Stomach and Guts. If the Blood were returned as hot as it goes to the outward Parts, the Heat would be augmented every Time it circulated, and it would be rendered ſo thin, that the Steam would pervade and not circulate it, nor would the Corpuſcles be of proper Magnitudes for Secretion. Perhaps this is the Reaſon why one's Pulſe is not much heightened when one ſweats in Bed. The Glands, whether they be a few together, or in large Bunches, muſt have Ducts into them out of the Blood-veſſels, or out of one another; ſome of them may have Paſſages out of the Blood-veſſels, ſome into one another, and all of them Mouths with ſmall Valves, to open and diſcharge outward, or into the Mouth, Stomach, Guts, or out of the Brain, Lungs, Liver, Milt, Kidneys, &c. which are all compoſed of, or full of infinite Numbers of Glands, and ſecrete the ſeveral ſorts of

Matter out of the Blood, moſtly in Form of Steam; Part for Uſes of the Parts of the Body, Part for Diſcharge, as well as the outward Pores in the Mouth, Skin, &c. That there are ſuch Glands and Juices ſecreted inward into the Stomach and Guts (of which I ſhall ſpeak hereafter) is evident by their Diſcharges in Vomits, Purges, Looſeneſs, but moſt demonſtrably in the bloody Flux. 'Tis likely moſt of their Ducts and Paſſages divide the Juices by the Figures or Dimenſions of their Apertures. But there may be ſome Ducts or Paſſages, ſo turned or bended, that they may admit Corpuſcles which are round or angular, and not thoſe which are ſmaller, but long, fibrous, or crooked, and ſome the contrary. Suppoſe there be Corpuſcles, or little Maſſes in the Blood of ten different Sizes or Figures, the ones leaſt or ſmalleſt, and the tens thickeſt or largeſt, &c. And the Paſſage or Duct into one Gland admit them all, and the Paſſage out again into the Blood or other Glands, let go the nines, and all ſmaller by Degrees, that Gland or Veſſel will be filled with tens. If the Duct into another admits fives, and all ſmaller, and the Paſſages out of it into the Blood, or into ſmaller Glands in its

Sides or Valves, admit fours, and all ſmaller, it will in Time be filled with fives, and ſo larger or leſs, ſmaller, longer, crooked, &c. down to the ſmalleſt Glands in its Sides or Valves. And the ſmalleſt Glands in the Valves or Sides of the greater, muſt diſcharge outward, or into the Stomach, &c. firſt: and the fineſt Juices firſt, and ſo ſucceſſively to the Juices which conſiſt of the groſſeſt or crookedeſt Corpuſcles or Particles in that Set of Glands at leaſt; becauſe the diſcharging the Juices out of the Glands in the Valves and Sides, of the greater or more inward, opens the Mouths of them, and permits them to diſcharge. When the Steam is too ſtrong, and that or any other Agent opens the Ducts in, or Paſſages out too wide, they will admit or let go too large; and when the Steam is too weak, or the Parts ſwelled or preſſed by the Steam, extending the Sides of the greater Tubes, wherein the Ducts or Glands are, or any other Agent, makes the Ducts into, or Paſſages out, too ſtraight, they will only admit, and let paſs thoſe which are too ſmall, and not ſecrete thoſe of proper Sizes, or Figures, and they cannot execute the Offices of one another. If thoſe which ſhould admit tens only admit nines, the tens muſt all ſtay in the Blood, and the nines admitted there will be wanted at their Poſt, and thereby in Time the Blood will abound with tens. If thoſe which ſhould only admit and diſcharge ones, admit and diſcharge ones and twos, the twos will be wanted at their Poſt, as in Fevers, when the Urine is red, &c. And 'tis likely the Ducts to, or Paſſages out of the Glands to the Gall-bladder do not ſecrete, or the Bladder does not diſcharge, when the outward Parts are filled with that Juice in a Jaundice. If the Paſſages out of the Glands into the Blood, which ſhould retain but one ſort, retain two ſorts, the two ſorts together will not execute the Office of the one ſort. And Corpuſcles of Salt of different Figures or Sizes, and different Quantities of the ſame ſort, or differently impelled, may open the Mouths of the Glands to different Degrees, when the Number of the Salts are but few or weakly impelled, they may open the Mouths of ſome of the ſmaller, and not be enough of them to open the Mouths of the larger. If the Mouths of the Glands be kept open after they have diſcharged the Juices collected in them, they will diſcharge the Juices promiſcuouſly out of the Blood, which can paſs their Ducts and Mouths without ſorting them. And 'tis very likely the Ducts in, and Paſſages out of the Veſſels and Glands in Plants, divide, collect and retain the ſeveral ſorts of Salts, Juices, &c. which iſſue out of the Earth into them after the ſame Manner: ſo that in Proportion to the Size, Figure, &c. of the Ducts and Paſſages in each Plant, and in each Part of each Plant, as they grow or encreaſe, or as they decreaſe or wither; and thereby alter the Dimenſions or Figures of the Paſſages in the different Seaſons, the Juices in each Part of each Sort, are nearly the ſame, ſome Alteration being made by this or that Sort abounding more or leſs, by the Proportion of this or that Sort in the Soil, &c. And whether the Pores in ſome ſorts of Stone, Metal, &c. may not admit and retain ſome ſorts of Salts, &c. I cannot tell, but the ſame ſorts of Salts, &c. are frequently found in the ſame ſorts of them. And thoſe of ſmalleſt Pores admit and retain Fire, either in the Earth or open Air, ſuch as Flints, &c. and ſo of Wood, Oil, &c. and the Corpuſcles of Cold after the ſame Manner. When any Body has a greater Quantity of Corpuſcles of Heat or Fire not clog'd, than is in the Part we touch it with, the Corpuſcles iſſue thence into the Part, cauſe a Senſe of Heat, and ſo on the contrary. The Corpuſcles of Fire mixed or entangled with Water, and moſt other ſorts of Fluids, except Oil, can act in Fermentation, but mixed with any Fluid except Oil or Spirits, they cannot act in the Air, till moſt of the Fluid be exhaled, or born off by Fire or Heat, and the Fuel be almoſt dry, and doubtleſs as the Moiſture is exhaled out of any Body in the Air, and the Pores contracted, Corpuſcles of Fire, volatile Salts, &c. enter and lodge in them.

The ſeveral Ducts to the ſeveral Glands in the Body, are proportioned each to admit, and the Paſſages out into the Blood to retain, each, Corpuſcles of different Magnitudes or Figures, to form Juices of different Conſiſtencies and Qualities; as the Juices which ſupply the Eye, Mouth, Gall, Stomach, &c. and perhaps the Brain to ſupply the Nerves with fine Steam. And the Capacity of the Glands are proportioned, each to contain ſufficient Quantity and their Mouths, outward Ends or Valves, to diſcharge ſufficient Quantity, each for their reſpective Uſes; and they are ſecreted in Proportion to the force of the Steam, and the Supply of it; in the opening of the Pores or Valves in any Part, which gives way for the Steam to drive out the Juices in the Glands next adjacent, along with it through the Skin or that Part, either without, or in the Mouth, Stomach, &c. till the Stock in the Glands be ſpent; and after that only Steam, and ſuch a Quantity of mixt Juices, as can be conſtantly ſecreted, till ſhutting their Mouths ſtop the Diſcharge, and they be by Degrees repleniſhed; and this is done involuntarily, ſleeping or waking, though perhaps the Will has ſome Power to direct or encreaſe the Force of the Steam, eſpecially that in the Nerves, waking more than ſleeping. This Operation of ſecreting the Juices of ſeveral ſorts at the Glands, in the ſeveral Parts, will not appear ſo difficult, if their Number and Diſpoſition be well conſidered; nor need there be ſo many Corpuſcles of leſſer Sizes returned out of the Glands into the Blood, for there is ſuch an infinite Variety of Ducts and Glands, and ſuch an infinite Diſproportion in Number, between the ſmaller and the greater Veſſels or Gland, that if one was to imagine the Stomach and Guts clean, and the Blood and Juices were all diſcharged

charged into them, and the Blood-veſſels were to ſtand empty and diſtended, and the Blood and Juices were equally mixed, and ſo mixed, iſſued out into the Blood-veſſels, &c. the thinneſt Parts or Juices would, as they paſſed the larger Veſſels, find their Way into the infinite Number of ſmall Outlets, and the Blood and Juices in the larger Veſſels would almoſt immediately be of the ſame Thickneſs they are at preſent, except where the Ducts to the Glands are ſo ſtraight, that they are deſigned to fill them but ſlowly, ſo that the Glands may be ſtocked when there ſhall be Occaſion to diſcharge the Juices for diſſolving the Meat, diſcharging the Excrements, and for ſuch Uſes as they are not conſtantly wanted, but at ſome Diſtances of Times: And when all act regularly this muſt be done, in every Circulation of the Blood, at leaſt a conſiderable Proportion of it. This might be demonſtrated; If a Pipe of a great Length, were bored in the Sides with Holes of different Sizes, proportioned in Number to the Quantity, and in Dimenſion to the Sizes of the Corpuſcles of ſeveral ſorts of Liquor, and thoſe Liquors were all mixed together, and one ſort more, whoſe Corpuſcles were too large to paſs any of the Holes, were forcibly pumped in, and the Pipe forcibly compreſſed, the Liquor whoſe Corpuſcles were largeſt, would be found ſeparated at the far End.

CHAP. XIII.

The Contrivance and Uſes of the Bags, Valves, and Stops of the Stomach, the ſeveral Parts of the Guts, &c. the Time when, and Manner how thoſe Bags and Tubes are extended or contracted, their Valves opened or ſhut, and how they diſcharge the Excrements downward, all involuntarily.

IN Order to know what is done in the Guts, we ought firſt to conſider the Form of their ſeveral Parts, the ſeveral Diviſions made in them by Valves or Stops, the Manner how each is diſtended or contracted, how the Valves between each Part are ſhut or opened, the Conſequences of extending or contracting each Part, and of ſhutting or opening each of the Valves or Stops which divide the Parts. Firſt, The Gullet has one or more Valves at the upper End, called the *Pharynx*, ſo contrived, that they reſiſt ſtrongly, and hinder the Steam, Meat, Drink, &c. from aſcending out of the Stomach, unleſs they be weakened by emptying the Glands in them, but open voluntarily and eaſily, to let the Preſſure of the Jaws or Air force down the Meat or Drink, and even whilſt they are going down, that the Steam ſhould not get Vent; for we cannot keep it open, and pour down a Fluid continually till the Stomach be full, but ſo much only at once, as the Space between the Root of the Tongue and that Valve will contain, and then ſhut up the Paſſage at the Root of the Tongue, which at once opens the other, and preſſes the Fluid down, and ſo alternately. And the Preſſure of the Air has ſome Share in the Action, for if one empty one's Lungs of the Air, take one's Mouth full of Fluid or Meat, and ſhut one's Mouth and Noſe, one can ſwallow little or none of the Fluid or Meat, but preſs it down in ſmall Quantity at once by the Strength of the Jaws, and the Remainder of the Air left in one's Lungs. It will be hard to aſcertain the ſeveral Poſitions of the Stomach, and the ſeveral Parts of the Guts, becauſe the Moment a Body is opened, the Steam in them extends them, and diſplaces every

Part. The Stomach can be diſtended to hold near a Gallon, and contracted into the Space of a Pint. When the Steam in the Stomach or any part of the Guts is weak or abated, ſo that the outward Preſſure prevails, the greater Share of the Blood is forced into the inward Parts, and the Veſſels and Glands in the Sides of the Stomach, or that Part of the Guts, are ſuffered within, and forced from without, to admit a greater Quantity of Blood and Juices; ſo when the Meat, &c. is diſcharged from the Stomach, and the Steam abated, the Air from without forces the Juices to ſecrete out of the Blood into the Glands of the Stomach, and filling the Veſſels and Glands contracts the Stomach, and leſſens its inward Capacity by Degrees, as the inward Force abates, and its Arteries, Veins, Glands, &c. fill. When the Stomach is contracted, and one takes Meat and Drink cold, the Juices iſſue, let the Stomach extend, and the Cold condenſes the Steam in the Guts, and makes Room for it. When the Meat and Drink is taken warm, they do not condenſe the Steam in the Guts, but extend the Rind of the lower Belly to make Way, and gives one a greater Senſe of Fulneſs with a leſs Quantity. When one has eaten a good Quantity of warm Broth, or, &c. one loſes one's Appetite: But if one drink ſome very cold Liquor, it condenſes the Steam, and makes the Stomach leſs diſtended or more empty, and the Guts make more Room for it, than before one drank the Liquor, and preſently after one recovers one's Appetite. When the Stomach is diſtended with Steam, and one takes Meat and Drink, it condenſes the Steam, and the Blood and Juices preſs into the Sides of the Stomach, contract them, and make them preſs cloſe about the Fluids, &c. As the Fluids, &c. expand, the Sides of the Stomach muſt extend; when the Ferment is high, the Steam can extend the Sides beyond the Extent of the Fluids, and form a Space only filled with Steam, as we ſee in Creatures after they are opened. When one eats too ſoon before the laſt Food be diſcharged, the Steam abated, and the Stomach contracted, and the Glands, &c. in its Sides filled with Juices, the new will be mixed with the old, and if it be taken warm, will keep the Stomach extended, and lie heavy for want of Juices to ferment it, and raiſe the Steam. If it be taken cold, it will condenſe the Steam, and the Stomach may contract ſo much, and after ſome Time, yield a few Juices to raiſe the Ferment. When the Stomach and Guts are kept diſtended, and the Juices intended for Fermentation, &c. are hindered from ſecreting out of the Blood into them for any conſiderable Time, the Meat will not be duly digeſted nor diſcharged; and if near the ſame Quantity of Juices, as are produced out of the Diet every Day, be not diſcharged with the Excrements, they muſt be diſcharged by Urine, Sweat, &c. or perhaps fall upon the Lungs, or remain in the Blood, and by Degrees overſtock it, make it ſharp, occaſion Scurvy, Jaundice, Strangury, Rheumatiſms, Gout, &c. And when by any means they get ſudden Vent into the Stomach or Guts, occaſion Fevers, Surfeits, Gout in the Stomach, Colics, &c. according to the Quality, Quantity, &c. When one has eaten a great Quantity of cold Fruit, or any ſuch Thing, that the Juices in the Stomach cannot raiſe a Steam whilſt they are ſecreting, and ſo are ſtill prevented from making any Reſiſtance in the Stomach, the Glands will ſtill ſecrete as faſt as the Ducts can convey the Juices into them, and at laſt ſecrete the Blood into the Stomach. And if ſuch Fruit or other cold

Matter cannot be fermented, the Juices will ſometimes open the Valves of the *Oeſophagus*, and the Stomach will, by the Aſſiſtance of the Preſſure of the Air, Expanſion of the Steam in the Guts, and Contraction of the Muſcles of the Belly, throw it up. If it be carried down into the Guts, and abate the Steam there, it will both abate the Courſe of the Blood, and give way for the Juices to ſecrete out of their Glands, and afterwards the Blood. If it raiſe a Ferment there it may occaſion a Fever. If it open the Valves, and force its Way downward, it will occaſion what they call a Bloody Flux. Indeed Cattle eat cold Herbs, &c. but in common Paſture they are ſo long in filling their Stomachs, that they do not condenſe the Steam in a ſhort Time, and their Blood contains not ſo much Spirits or volatile Salts; ſo that when the Steam is condenſed, the Juices do not flow in ſo violently, nor are ſo ſharp. And they chooſe ſuch Plants as they can digeſt, and refuſe the ſour cold Plants, and if for Hunger, or by being kept long to dry Meat, they be forced to eat too much of them at once, or too haſtily, they have much the ſame Effect as Colic, Gripes, &c. and ſcarce any Creature except Swine, will eat much cold raw Fruit; and 'tis likely it will have the ſame Effects upon them. And as Cattle are ordinarily far longer in filling their Stomachs, ſo they eat a much greater Quantity, and make greater and more frequent Diſcharges in Proportion, and their Glands for Juices for Digeſtion muſt be contrived to make more leiſurely, and more conſtant Diſcharges; and the Glands for diſcharging the Excrements to be ſooner filled, and more frequently diſcharged. The *Pilorus* or Outlet from the Stomach into the Guts ſeems to have Valves, and the Sides of the Neck are thicker than other Parts, and the more Veſſels there are, when they are filled, will cloſe that Part ſooner than where they are thin: whether when the Steam in the Stomach is ſpent, the Veſſels in the Sides fill and contract the *Pilorus*, or ſhut the Valves before we eat or drink, I cannot tell; but when Meat and Drink goes cold into the Stomach, the cold almoſt wholly condenſes the Steam, and the Reſiſtance within being taken away, the Blood and Juices will be violently preſſed thither by the outward Compreſſure of the Air, and the *Pilorus* muſt ſhut and reſiſt any thing from paſſing out of the Stomach into the Guts, or out of the Guts into the Stomach, till ſome Juice open the Glands in its Valves, or in its Sides, and by diſcharging the Juices out of them, weaken or extend them. Whether the Fluids in the Stomach fermented to ſuch a Degree, or the Pancreatick or Gall, or other Juices out of the Guts, aſſiſt in opening it, I cannot tell; perhaps it may be opened by the Strength of the Steam in the Stomach, by extending the Stomach, and repelling the Blood out of the Tubes in the *Pilorus* to let the Steam paſs into the Guts: But I think it cannot be opened by the Steam in the Guts to let it paſs into the Stomach. There ſeems to be a Neceſſity that the *Pilorus* ſhould be ſhut and opened, for if there were not a ſtop there, the cool Drink put into the Stomach would run down into the Guts, and condenſe the Steam there; things digeſted and undigeſted, Lumps of Solids among the Fluids, would go altogether. And when the Steam in the Stomach grows weak, the Steam would ariſe out of the Guts, hinder it from contracting and ſecreting Juices for fermenting and diſſolving the Meat and Drink. When the Stomach is newly filled, and the *Pilorus* ſhut, its Bottom will ſettle and hang lower down, and the higheſt Parts of the Guts being extended by the Steam in them, will riſe upward, and continue ſo till the Juices diſcharge, the Ferment begin, extend the Stomach, and open the Mouth of the *Pilorus.* Whether the Steam in the upper End of the Guts can raiſe them ſo high, that the Juices iſſued from the *Pancreas* and Gall-Bladder, can run into the Stomach to aſſiſt in heightening or ſlackening the Fermentation, or for ſome other Uſes; or whether that Poſition of the Guts can invert the Gall-Bladder, and make it empty; or whether thoſe Juices are only iſſued into the Guts, I have not had Opportunity to obſerve. When the *Pilorus* opens, the Steam will iſſue down into the Guts, and the Contents of the Stomach, which are thin enough, and above the Level of the *Pilorus*, will go off into the Guts, and when the reſt is as much digeſted as it can be there, the Agents gone off, and the Steam abated, and the Cauſe which extended it weakened, the Air preſſes the Blood and Juices into its Sides, and contracts it. The Preſſure of the Air upon the lower Belly, and the Expanſion of the Steam in the Guts below, jointly lift up the Bottom of the Stomach by Degrees, till it come to the

Level of the *Pilorus*, and ſo leiſurely empties the Contents downwards, and contracts and compreſſes the empty Stomach into a very little Compaſs. The Sides of the *Duodenum* are thicker than the reſt of the Guts, whether it be to reſiſt the Sharpneſs of the Juices iſſued into it, or the Strength of the Steam ariſing in the Guts, when the *Pilorus* is ſhut, or contract, iſſued Juices, and extend, I cannot tell. When one has faſted very long, ſometimes one loſes the ſenſe of Hunger; a new Ferment riſing in the Stomach, and extending it: whether the Glands then diſcharge thoſe Juices, and they work upon the Remains or Phlegm there, or whether ſome Glands ſecrete ſome mucous Matter, which jointly with them makes a Ferment, and is deſigned to keep in the Fire, I cannot tell: But if that go off the Stomach alone, it ſometimes cauſes Colical Pains, &c. ſometimes about an Hour after eating or drinking any ſort of Matter, which irritates the Glands in the Neck of the Stomach, eſpecially the Broth of ſtewed Beef, or ſuch Things, which are full of Oil mixed with Salts, which ſwim upon the Top of the Contents in the Stomach, or if one ride hard, or uſe Exerciſe which throws that Matter up the

Neck of the Stomach, it opens the Glands, and makes one puke ſome of that Mixture, and ſome time after eating Oil or fat Meat, one pukes ſome of the Juices ſecreted out of the Stomach, clear or unmixed, which induces me to believe, that they are ſecreted out of the Glands above the Meat and Drink in the Stomach, and prevented from mixing by Oil or Phlegm ſwimming at the Top of the Meat and Drink in the Stomach, and 'tis likely are intended to diſſolve what ſo ſwims at the Top, and eſcapes the reſt: For I cannot perceive how ſuch a thin penetrating Juice could aſcend from the Bottom, and eſcape mixing with the reſt: ſometimes afterwards the Oil comes up mixed with thoſe Juices deſperately ſour, bitter, or, &c. I think the Guts hang upon the Meſentery, ſo that the Sides of them are always full of Steam, and it is likely the Lacteal Veſſels, through which it paſſes, have their Mouths on the upper ſides, and are thence continued into the Glands, and that the Steam can paſs along the upper Sides of the Guts from Valve to Valve, eſpecially where the Excrements are fluid, and the Parts not contracted without pervading much of the Fluid. The two firſt Parts, *viz.* the *Duodenum* and *Jejunum* make ſo long Bends, that but a ſmall Quantity of the Fluid Maſh deſcending from the Stomach reſts in them, but falls down lower, ſo that they are ſeldom found filled with any Thing but Steam, and the greateſt Share of the Lacteal Veſſels iſſue out of the latter, which is another Evidence that the Chyle paſſes in Form of Steam. The third Gut, or *Ilium*, hangs in ſhorter Bends or Folds like Bags, ſo that when they are filled with Excrements, and extend or hang down, they retain them. The fourth, or *Cæcum*, hangs like a Branch between the Bottom of the *Ilium*, and Top of the *Colon*, and ſerves as a Bag to repoſite the Excrements which fall down the *Ilium*, till the Valve at the Top of the *Colon* open, and then the Excrements are diſcharged out of it into the *Colon*, after the ſame Manner as the Stomach and other Bags, by the Expanſion of the other Parts lifting up its Bottom, &c. The fifth, or *Colon*, hangs in Bags much after the ſame Manner as the *Ilium*, and is divided into Bags, by Ligaments or Strictures, and retains the Excrements much after the ſame Manner, and prevents the fluid Maſh from falling down, all at once towards the lower End, and preſerves Part of the Fluid in each Fold to raiſe Steam. At the low End of the *Ilium*, and upper End of the *Colon*, there is a Valve placed, ſo that nothing can paſs but when it is opened. As the Excrements or Maſh ſettle lower, the Fluids go off in Steam, and the Remainder becomes ſtill leſs and leſs Fluid. Contraction, or Diſtention, 'tis likely has leaſt Effect in the two upper Parts, becauſe they are moſtly empty, or their Contents are very thin, unleſs ſome Stop by Phlegm or, &c. happen. But perhaps in the Folds of the two lower, where the Excrements are leſs fluid, the Bags may contract ſo far as to hinder the Steam from paſſing through them, till Juices ſecrete, raiſe a new Ferment, and re-extend them. If the *Cæcum*, and the low End of the *Ilium*, next the Valve at the Top of the *Colon*, be filled with thick Excrements, when there is no Steam in them, or below ſufficient to reſiſt, the Steam above will preſs upon them, and puſh or thruſt them forward with a great Force. If the Guts were all of one Wideneſs, and not ſo bended and girt with Strictures, the Fluids would run down to the next Stop or Valve, make no Stay in the upper Parts, fill the lower End, and leave the upper End empty. As they are contrived when the *Pilorus* opens, and the Steam and Fluids go off from the Stomach, they will extend the Bags as they go, fill the firſt Bag firſt, and when that is full, the Fluid will run over the Bend, or Stricture to the next, and ſo fill each ſucceſſively as more Fluid goes off. If the Guts had a ſerpentine Winding, or Periſtaltick Motion conſtantly, it muſt be performed by the Steam driving the Blood along the Arteries, at each Puſh, moving the Guts as it paſſes the Arteries in their Sides, which Blood muſt be repelled along the Veins in the Sides of them, by the Expanſion of the Steam within the Guts, and the Reſiſtance of the Inſides of the Trunk, or if they only had ſuch a Motion ſometimes, it might be performed by the Motion of the Steam, when the *Pilorus* opens, iſſuing from the Stomach downwards, and the Fluids along with it, and ſo on after the Guts are filled with Steam, as it gets Vent: But if there were ſuch Motions, they cannot be ſufficient for diſcharging the Excrements out of the ſeveral Bags and Folds, and at laſt out of them at the Fundament; nor do I think it poſſible, that the Guts can have any Periſtaltick Motion, becauſe they, &c. fill the fill the Trunk cloſe, and have no Room to move and ſhift in, otherwiſe than as the Steam abates in one Part, and encreaſes or extends in another; the one Part will be compreſſed, the other extended, and nothing can deſcend, or be emptied downward out of the Bottom of the Stomach, or the Bags of the Guts, but by their being lifted up to the Level of the *Pilorus* of the Stomach, or the Tops of the Bags, or Strictures in the Guts. When the Stomach begins to diſcharge into the Guts, it fills them, and extends them: by their Ferment as they fill and extend, the Reſiſtance in the Stomach being leſſened, they lift up its Bottom, and by Degrees empty it, as the lower Parts of the Guts fill and extend with the Ferment and Steam; and as it abates in the upper Parts, they lift up the Bottoms of the Bags in the upper Parts, and diſcharge the Fluids downward ſucceſſively to the *Colon*, which ſeems to be another Repoſitory for the Excrements, wherein 'tis likely they undergo ſome farther Fermentation like a ſecond Stomach; but differs in ſeveral Reſpects. It has lacteal Veſſels out of it to carry off the Steam when there is a Ferment in it. When it is extended with Steam, it lifts up the

Bags in the Guts above it, and makes them empty downwards towards it, and when the Valve at its Top opens, which perhaps is when the Steam in it abates, the Excrements at the lower Ends of the Guts above will fall, or be preſſed into it. Whether the Bags in the Guts, or the Valve at the Top of the *Colon*, always keep Fluids in them to raiſe Steam, and keep them ſomewhat extended, I am not certain; but if they ever make a ſudden Diſcharge into the *Colon*, and the Steam in them be much weakened, perhaps they may contract, and their Glands be ſtocked with Juices to raiſe a new Ferment in the next Supply; and the *Colon* during the Time the Steam in it was weak, would repleniſh its Glands with Juices to raiſe a new Ferment, and ſupply the lacteal Veſſels with Steam; whilſt that in the Guts is weakened. And whether when ſuch a Diſcharge is made into the *Colon* out of the Guts, or the Fluids are moſtly born off, and the Steam weakened there, and the Steam in the Stomach be ſtrong or ſtronger than that in the Guts, it may not contribute to open the *Pilorus*, and give the Steam and Maſh Paſſage into the Guts, I cannot tell.

When

The Manner of the Excrements being puſh'd down and evacuated.

When as much of the Maſh has paſſed one of the Stops that the Steam above is abated, the Valve ſhuts by the Preſſure upon the Blood within the *Colon*, reſts or leans upon the Loins ſlanting, ſo that when the Fermentation in it is over, and the Steam abates, the Preſſure of the Steam in the Guts above, forces the Excrements in it downward. Whether the Fermentations in the ſeveral Parts are carried on by the Juices iſſued out of the Sides of the Stomach, or they are renewed or aſſiſted by Juices iſſued out of the Sides of the ſeveral Parts of the Guts, or by the Gall and Pancreatick Juices, or whether there is always as much fermented Fluid left in the Bags of the Stomach, Guts, and *Colon*, as will contribute ſomething like Leaven, to raiſe a new Ferment in the next Supplies of Meat and Drink, and whether, the longer they continue there, the ſtronger they may grow for that End, in defect of Juices being ſecreted out of the Blood, I undertake not to determine. The *Rectum* reaches ſtraight from the Bottom of the *Colon* to the Valve at the Fundament, there is no Valve at its Top, becauſe I think as the Excrements are generally pretty thick there, they would not very eaſily paſs a Valve, but that I think is ſupplied by the Thickneſs of the Sides of the Gut, whereby the Juices iſſued out of the Blood into the Veſſels and Glands in its Sides, can ſhut or contract it cloſe, and by iſſuing thoſe Juices extend it. Whether each Ferment in the *Colon* opens the End-Gut, and preſſes the Excrements into it, or it is opened by iſſuing the Juices out of the Glands in its Sides, deſerves to be conſidered; the latter I think is more likely, becauſe if it were kept open during the Fermentation, the Preſſure would be too great, and too long upon the Fundament. 'Tis likely when the End-Gut is full of Excrements, ſuppoſe half fluid, half ſolid, as the Steam goes off, and bears off the Fluid, the Top of it, at the Bottom of the *Colon*, contracts and partly ſhuts, and when moſt of the Fluid is gone off in Steam, the Gut contracted, and the Fluid as it were ſqueezed out, and the ſolid Excrements formed in a Mould, the Glands in the Sides will be filled with Juices ſecreted out of the Blood to be ready upon Occaſion to iſſue, extend the Gut, and diſcharge the Excrements. That the End-Gut, and perhaps the *Colon* contracts, is evident by the hard Excrements of the ſame Man, moulded at different Times, of different Thickneſſes; and 'tis more demonſtrable in ſome Brutes, where every Bag forms the Excrements into round Lumps, according to the Dimenſion of each Bag ſo contracted, ſometimes greater, ſometimes leſs. Any ſudden Increaſe of the Force of the Steam, ſuch as when the outward Pores are ſuddenly reſiſted by an Increaſe of the Preſſure of the Air, or the outward Pores being ſuddenly ſhut by an Increaſe of Cold, or by the Emiſſion of the Juices into the Stomach after eating, which may encreaſe the force of the Steam ſuddenly, the Steam may prevail where there is leaſt Reſiſtance, and force the Juices out of the Glands into the End-Gut, and cauſe a Diſcharge of the Excrements. When the Steam is too thin, ſo that it goes off too quick at the Pores, its Force inward is not ſo great, and one ſeldom has any Diſcharge then. Sometimes the Juices which open the Glands in the End-Gut and Fundament may deſcend from above, as in a Purge or Looſeneſs, or out of the *Colon* when the Juices ſecrete in too great Quantity, or too ſharp, raiſe too high a Ferment there, and open the Glands in the End-Gut. When that

Gut is open, it gives Way for Excrements to ſettle down into it. When that and the Fundament both open at once, both thick and thin go together, till the Steam within the *Colon* abate, and the outward Preſſure of the Air drive in the Blood, &c. contract the End-Gut, and ſhut the Fundament. When the Top of the End-Gut is contracted cloſe or ſhut, if there be any Excrements below, you may diſcharge them, if none, you may have the Piles, or diſcharge Juices or Blood. When the Fundament is not opened by diſcharging Juices, the Excrements may lodge in the End-Gut very large and hard, and you cannot diſcharge them. When there are Excrements in the End-Gut, and the Valves in the Fundament are weakened by diſcharging the Juices, if the Top of the End-gut be not open, and the Steam in the *Colon* be not pretty ſtrong to preſs down the Excrements, the Diſcharge will be made with great Difficulty. When there is any Stop at the Bottom of the *Colon*, or the Top of the End-gut is contracted, ſo that he Excrements and Steam fill not the lower End of the End-gut, the Fundament will be preſſed in higher than at other Times, which is a plain Indication, that the Re-

The Occaſion of the inward and outward Piles.

ſiſtance within is weaker; and there being little Reſiſtance within, the Air and Steam will preſs the Blood into the ſides of the End-gut, and force the Juices into the Glands and extend them; and if it continue long, or be ſo often, occaſion the inward Piles; and if the Juices be ſalt or ſharp, they may fall down and reſt upon the Valves of the Fundament, and cauſe the outward Piles. If upon having a Stool, Part of the Valves of the Fundament be extended outward, the Juices will preſs into them, and form little Bags reſembling Piles, and the Juices will be diſcharged out of them outward; but if they be ſpeedily put up with the End of one's Finger within the Valves that will be prevented. If the Steam in the End-gut be ſtrong and reſiſt them, ſo that they are difficult to be forced up, or are puſhed back, if you diſcharge the Steam downward, they may immediately be put up eaſily. If the Parts be dry, ſo that they will not ſlide up, a little Oil, upon the End of the Finger, makes them ſlip up.

Steam, the Agent, contracting the Stomach, and the Time it acts.

The Veſſels in the Side of the Stomach and Guts, and the Valves in them muſt be extended, and the ſpace within contracted or ſhut either by Blood and Juices preſſed into them, or by animal Spirits or Steam iſſued into their Muſcles (if they have any) and it muſt be done only when the Reſiſtance within is abated; I think it cannot be done by the latter, becauſe we can direct the animal Spirits to act upon the Muſcles, and the Will has no Power there; beſides they are frequently long in contracting, and continue long contracted, and I think the Muſcles in any Part cannot be long extended, but the Force will abate. If the Steam be abated or condenſed, or the Excrements diſcharged ſuddenly, the Sides of the Part will contract, and the Valve will ſhut ſuddenly, if leiſurely, leiſurely. But the Glands in the Sides of the Stomach, Guts, &c. for ſecreting Juices for Fermentation, &c. need not be ſuddenly filled, becauſe they are only needed upon a freſh Supply. Whether the Mouths of the Glands which contain the Juices for Fermentation, in the Stomach and Guts, be opened to ſecrete them, by condenſing the Steam there, or by ſome Corpuſcles of Salt, or, &c. in the Aliment, or by the Friction of the Aliment upon their Sides by the Motion of the Lungs, Body, &c. till they raiſe a Steam, and whether that Steam extending the Sides of the Parts, preſs out the Remainder of the Juices, or theſe or other Cauſes jointly contribute, I cannot tell. But 'tis plain when the Steam in the Stomach, or any Part of the Guts becomes ſtronger than the Preſſure of the Air, it will repell the Blood out of the Blood-veſſels in the Sides of that Part, extend the Sides of that Part, and ſtraighten or flatten the Blood-veſſels therein. Whether the Glands in the Valves or Stops in the Guts be opened by Steam, which always has Paſſage from ſtop to ſtop, unleſs accidentally ſtopped, or by Juices ſecreted the laſt out of the Glands in the Sides of the Part above, which in a Vomit or Purge ſeem to be moſt penetrating, or by ſome Juices iſſued out of peculiar Glands near the Valve or Stop, or by the Juices in the Maſh when they are fermented or ſharpened to ſuch a Degree; or whether one of them may be opened by one Means, and another by another, I cannot tell. The Corpuſcles of the Steam may open the Glands in a Valve or Stop, where they have free Paſſage to it, but if there be thick Excrements above it they will ſtop it. If the Juices paſs any conſiderable Diſtance from above, they muſt operate on all the Parts they paſs through, and make the Bags, or Folds, capable of ſending down the

Fluid, and there muſt be a conſiderable Quantity of them, if they mix in the Maſh, to act at the Bottom: If the Juices iſſue near the Valve or Stop, they may come at it unmixed, and without making any Alteration above; though they are all opened by the Corpuſcles in ſome ſort of Diet, and by the Maſh when fermented, or ſharpened by a great Quantity of Juices. I think ordinarily the Glands in the Valves, eſpecially the low ones upon which the drier Excrements reſt, are opened by Juices iſſued out of the Sides of the Guts next above them; however it is, a plentiful Diſcharge cools and eaſes all the Body more than could be done barely by diſcharging the Excrements, 'tis likely it is by diſcharging the Juices out of the Glands, Blood, &c. During the Time that there is an extraordinary Ferment in the Contents of the Stomach and Guts by the Qualities of the Meat, Drink, by too great an Emiſſion of Juices, or that all the Parts continue too much diſtended by the Craſsneſs of the Steam or Stoppages in the Veſſels, the Diſcharges of the Excrements downward cannot be regular; becauſe none of the Bags can be lifted up and emptied; and when the Steam does not riſe in due Proportion in any of the lower Parts, for Defect of the Cauſes aforeſaid, they will not extend and lift up thoſe above them, to diſcharge the Fluids out of their Bags downward. When too great a Quantity of Juices, or Juices too ſharp, are ſecreted into the Stomach, or any of the upper Parts, they do not only make too great a Ferment there, but in all the Parts as they paſs, till that Fluid and all it mixes with, be diſcharged. When the Guts are vaſtly diſtended, and the Stomach contracted, one can ſcarce get any Meat or Drink down into the Stomach, and perhaps they ſcarce let the Bottom of the Stomach ſettle low enough to keep the Fluids till the Meat be digeſted. It will not ſeem ſtrange, why one Part of the Guts contracts, while another extends, or why the Steam in one Part is ſtronger than the Steam in another, ſince, as I ſaid, the Strength of ſuch infinitely ſmall Agents, is to be computed by the Numbers. And 'tis eaſy to compute how vaſt a Difference there muſt be between the Number of Agents in the Maſh, when it is newly put into the Stomach, and the Juices ſecreted into it; ſome of their Corpuſcles being extremely ſubtile, and ſome of them capable of being vaſtly expanded; and in the Remainder of the Maſh, when it has undergone the Fermentation, and the Agents and Parts they could bear are moſtly gone off in Steam, or between that Remainder of the Maſh when it's ſo left, and when a new ſupply of Juices are ſecreted into it, and a new Fermentation raiſed, or between the Juices iſſued for Diſcharge by the Sides of Excrements, almoſt dry, which Juices will be immediately expanded and raiſed into Steam, and the ſmall Quantity of Steam which could be iſſued out of thoſe dry Excrements. If there were not ſuch Stops and Bags in the Stomach and Guts, the Stomach could not retain the Aliment till it had digeſted it, the ſmall Guts till moſt of the Fluids were born off in Steam, the *Colon* till it had fermented the Remainder a-new, the End-Gut till it had ſent off the Humidity, and ſecreted Juices to diſcharge the Excrements. If there were not ſuch Valves or Stops, which when ſhut ſtopped the Steam, no Part could be contracted by an Abatement of the Steam there, becauſe it would be equal in all Parts, nor could the various Operations of each Part be managed alone, if thoſe Valves did not divide, and keep them in ſeveral Parts as they are. When the Steam is ſpent in one Part, the

The Uſes of the Stops and Bags in the Stomach and Guts.

Valves can ſhut, the Juices contract that Part, and diſcharge for their ſeveral Uſes, while the Steam iſſues from another Part to circulate the Blood. Beſides all the Maſh would fall to the loweſt Parts, and they would be full, and all the upper Parts empty, and the Steam would continually preſs the Excrements upon the Fundament, and when it opened, make too great Diſcharges both of Excrements and Steam. Indeed human Bodies, and thoſe which go upright, have more occaſion for Stops in their Guts, than thoſe Creatures have which go upon all four, with their Bodies parallel to the Ground.

The Secretion of the Juices into and out of the Glands, the raiſing, paſſing and perſpiring of the Steam out of the Pores, Lungs, &c. and the Diſcharge of the Excrements being principal Actions in the Body, let us conſider what furthers or hinders them.

CHAP. XIV. SECT. I.

The common and accidental Agents or Cauſes, which contribute to make the Juices ſecrete out of the Blood-Veſſels into the Glands on the Sides of the Stomach and Guts, with their Effects and outward Appearances.

DIſcharging the Meat and Drink, and eſpecially the Steam, abating the Fermentation, condenſing the Steam by cold Meat or Drink, or by cool heavy Corpuſcles in them, &c. which abates or takes away the Reſiſtance within, and ſuffers the Preſſure of the Air, and the Steam in the Blood-veſſels to fill the Blood-veſſels in the Sides of that Part of the Stomach or Guts, contract them, and force the Juices out of the Blood-veſſels into the Glands in their Inſides, and ſtock them there for Fermentation, Diſcharge, &c. There may be other Cauſes that contribute, ſuch as the Thinneſs of the Blood, Cleanneſs and Openneſs of the Ducts into the Glands, cool Air to prevent the Steam from iſſuing too faſt at the Pores, moderate Action, &c. If the Juices be ſecreted in due Proportion, the Blood will be ſweet and cool; if too few, the Blood will be too hot and ſharp; if too many, the Excrements will be too hot and ſharp, &c. as aforeſaid.

SECT. II.

——*Which hinders the Juices from ſecreting into the Glands, &c.*

STEAM, which keeps the Sides of the Stomach and Guts too much extended, flattens the Blood-veſſels, hinders the Blood from circulating thro' them in due Quantity, and preſſes the Glands, that the Air cannot drive the Juices into them; either by riſing in too great Quantity, or by being too groſs, or by the Straightneſs or Foulneſs of the lacteal Veſſels, Thickneſs of the Blood, or frequently for want of Action.

SECT. III.

——Which opens the Mouths or Valves of the Glands, in the ſeveral Parts, to diſcharge the Juices for the ſeveral Uſes, &c.

INcreaſe of the Preſſure of the Atmoſphere, or Diminution of the Expanſion of the Steam within, or the Corpuſcles of Fire, Salt, or pointed Bodies applied in proper Fluids or Steam, with the Motion of the Fluids or Steam, or other proper Agents to impell or wreſt them, to fret off the Coats or Phlegm, &c. which cover their Mouths with a ſort of Skin, or to cleanſe the ſtagnant Matter out of their Mouths, or to open their Mouths, by being puſhed in like Wedges, or in extraordinary Caſes, by taking off or thinning this outward Skin, cutting their Valves, or Sides, &c. It may ſeem ſtrange to aſſert, that the ſmall Corpuſcles of Fire, or volatile Salts, can open the Valves of the Glands in the Stomach, &c. But if we conſider that the Valves of thoſe Glands, which we ſee or diſcover with Glaſſes, are compoſed of Glands ſtill ſmaller and ſmaller, and

Valves to them proportionable to the Magnitudes of the Corpuſcles of Fire, Salts, &c. even ſuppoſing as ſmaller as we can imagine, and the Corpuſcles which conſtitute the Juices in them ſtill ſmaller, and that opening the Mouths of the ſmalleſt Glands diſcharges the Juices out of them, and weakens and opens the Valves of the Glands ſucceſſively larger; and that if the Corpuſcles do but open the Mouths of the ſmalleſt Glands, till the Steam which before circulated into the Blood, get Vent at the Mouths of them, it will ſoon open the Valves wider, and that if ſmall Bodies by rebounding, can expand and ſtretch the Veſſels that contain them to any Extent, which any other Force can, the Operation will appear more practicable. The Conſequences of their being opened too much, or continuing open too long, have been mentioned above.

SECT. IV.

—— *Which ſhut the Mouths of the Glands, &c.*

EXpanſion of the Steam within, Diminution of the Preſſure of the Air without; the Thickneſs or Cloſeneſs of the Glands within, and the Weakneſs or Openneſs of the outward Pores. Phlegm, or tough cloſe Matter, which cover the Mouths, or ſtagnant Matter in the Mouths of the Glands, Corpuſcles of ſome ſorts of Matter, which they call Aſtringents or Stipticks, which dry or thicken the Juices in the ſmall Valves, and ſcorch the Valves, and ſome blunt or flat ones, which are ſo figured, as to fit and ſtop their Mouths, or to be preſſed againſt, and cover them, or, &c. That Corpuſcles infinitely ſmall can ſtop the Mouths of the Glands, will not appear ſo ſtrange if it be likewiſe conſidered, that ſtopping the Mouths of the ſmalleſt Glands, which compoſe the Valves of the greater Glands, ſtops the Mouths of the greater, by hindering the Juices from being diſcharged out of the Glands, which compoſe the Valves of the greater Glands, and hindering them from opening. If when the Glands are full, the Steam can riſe and extend the Stomach without emptying the Glands, it muſt cauſe a Senſe of Fulneſs or Stitches and Pain, acccording to the Strength and Quality of the Steam.

SECT.

SECT. V.

——*Which raiſe the Steam, &c.*

THE Clearneſs of the Stomach of Phlegm, or ſuch Matter as can ſheath the Agents, ſufficient Quantity of Heat, and proper Juices in the Stomach, or ſecreted into it, a due and proportional Quantity of Meat and Drink, ſtocked with a due Proportion of Salts and Spirits, and of Matter not too craſs or viſcous, ſufficient Action, ſometimes they riſe too faſt by too hot or too ſalt Meat, too much ſpirituous Drink, too violent Exerciſe, Stoppages of the Paſſages or Pores where the Steam ſhould circulate or perſpire, too great an Addition of Heat, too great a Diſcharge of Moiſture by hot Air, Fire, keeping off the Preſſure of the Air in Bed, or by Clothing, which lets the inward Steam open the Pores, and keeps off the Motion of the Air, which bears off the Corpuſcles of Heat diſcharged, and ſupplies their Places with Cold, ſometimes by too great a Secretion of brinous Juices, or of Juices too ſharp, into the Stomach and Guts. By the Effects upon the ſeveral Parts, Judgment may be made whether the Steam riſe in due Proportion, or too faſt, or too craſs, or too ſharp. When the Preſſure of the Atmoſphere is ſtrong, and the Air clear, if the Steam riſe, and paſs in due Proportion, the Blood, in young healthy Perſons, will circulate briſkly, the Body be light and active, the Muſcles ſtrong, the outward Parts plump and ſmooth: If too faſt it will inflame the Body, affect the tender Veſſels in the Head, &c. diſcharge the Moiſture too much at the Pores and Lungs, force off ſome of the finer Corpuſcles of Blood with the Urine, make it red and hot, leave the Excrements hot and dry, make too much of the Blood appear in the outward Parts, cauſe bleeding at the Noſe, &c. When to that Degree we call a Fever, the Steam exhales ſo much of the finer Juices, that it leaves not ſufficient to extend the Glands, and diſtend the Muſcles, and at the latter End when the outward Glands are empty, the Parts will be lank and withered; and when there is not Steam ſufficient, or when 'tis too fiery or penetrating to extend the Muſcles, the Parts will move weakly and be ſore, and move with Uneaſineſs or Pain. If the Steam riſe much faſter than it can paſs at the Lacteal Veſſels, it will extend the Stomach and Guts till they be ready to burſt, and frequently burſt the Stays, or any thing which confines them, and paſſes the Place, and ſtop the Extenſion of the Lungs, and that which gets out, flies with ſuch Force into all the Parts, eſpecially the tendereſt in the Head, that it ſtops the Senſes till it gets Vent by Degrees, or ſomething cool be taken into the Stomach to condenſe or clog the Steam. Whether this be the Cauſe of Apoplectick Fits, I have not had Opportunity to obſerve. Whether the Will, in any ſudden Surprize of Joy, Fear, &c. can direct the Steam to the Stomach or Guts, and force the Glands ſuddenly to ſecrete a great Quantity of the Juices which are ſo volatile, I cannot determine. But when the Steam is put into violent Agitation, by Abundance of Juices flowing into the Stomach, by ſudden Frights, and in ſeveral ſorts of Fits, as ſoon as it begins to paſs, the Perſons are much ſtronger than at other Times. Where the Steam is raiſed too high by the Juices ſtopping the Glands, abſorbing or ſheathing the Juices, ſtops or leſſens the Effect, and diſcharging from the

Stomach, or any other Way, takes away the Cauſe.*

SECT. VI.

—Which hinders the Steam from riſing.

TOO much Phlegm, or other viſcous Matter which entangles and overpowers the Agents or Juices; want of proper Juices in the Blood to ſecrete into the Stomach, Stoppages in the Glands, or ſomething which hinders the Juices from ſecreting into the Glands, or out of them into the Stomach, want of proper Juices and ſufficient Quantity in the Stomach, or the Preſence of ſomething which abſorbs or blunts them; too much Meat and Drink, or too great a Proportion of Meat to Drink, or of Drink to the Meat; want of ſufficient Quantity of Spirits or Salts, or the Preſence of Matter which ſheaths and entangles them, and is too craſs to be born off by them; want of Action. If the Steam riſe too ſlowly, either the Glands do not ſecrete brinous Juice enough into the Stomach, or 'tis

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* Let this be compared with the common Practice, and I believe the Succeſs will prove what is alledged; tho' the Reaſon has hitherto been very obſcure.

'tis not ſharp enough, or there is a Load of tough cold Phlegm which goes not off, but ſtops the Glands, and entangles the Salts. If it be Phlegm, in a Morning when your Stomach is lank, and you lie upon one Side, you will feel a Load or Preſſure there; or if you drink a good Quantity of ſpirituous Drink, or uſe violent Action, and the Stomach do not extend, or the Blood circulate briſkly, 'tis likely the Glands ſecrete too much Phlegm into the Stomach, or you have a great Load of Phlegm there, and that, if not diſcharged, will in time make the Excrements and all the Juices of the Body tough and craſs, the Paſſages and Glands foul and ſtraighter, your Blood move ſlowly, your Body weak, dull and inactive. Nature fences againſt the Effects two Ways, by making the lacteal Veſſels ſtraighter, the leſs craſs Matter can go into the Blood, and makes the Defect ſupply a Cure. For as we then need more Salts to divide the Matter in the Stomach, increaſe and excite the Steam, the Paſſages for ſecreting the Urine, and the Pores are ſtraightned by the Phlegm, and thereby the Salts are prevented from ſecreting, and the Water is only permitted to paſs thin and clear. The Salts retained are employed till they be able to digeſt the Phlegm, increaſe the Steam, and clear the Paſſages, which generally creates a Struggle, and as 'tis effected, the Water ſecretes ſalt, foul, and turbid.

SECT. VII.

—— *What make the Steam paſs.*

THE Rarifaction of the Steam, the Abatement of the Preſſure of the Atmoſphere, the Thinneſs of the Matter in the Guts, the Cleanneſs of the Sides of the Guts, the due Wideneſs and Cleanneſs of the Lacteal Veſſels, the due Thinneſs of the Blood, a due Strength in the Muſcles of the Heart and Valves; the Cleanneſs and Openneſs of the Capillary Veſſels to let it perſpire, or paſs to the Bladders in the Lungs or Pores in the Skin, the Thinneſs and Cleanneſs of the Skin, and Openneſs of the Pores; a pure cool Air to bear off the Steam from the Lungs; moderate Action of all the Parts; to which I may add Sleep, in a warm Place or Cover, that rarifies the Steam, thins the Fluids, and ſtocks or repleniſhes all the Parts therewith. If the Blood move briſkly, and the outward Parts be lank, either the Capillary Veſſels are full of Matter ſo craſs, that the Steam cannot enter, or the Pores are too open, and let it paſs too quickly out. If the Blood move briſkly, and the outward Parts be too full, either the Blood is too thick, and paſſes not the Capillary Veſſels, or the Steam vents not at the Pores, as it happens when you put your warm Hands into cold Water, the Steam is ſtopped from venting, the Parts extend, and you feel a burning Heat within them; or when too much Cold has ſtagnated the Juices in the Parts, the Steam inflames them. When you have had a free Stool, the craſs Excrements in the upper Guts will be preſſed downward, ſucceed thoſe diſcharged, and thinner Fluid will ſucceed from the Stomach into the upper Guts, and the greater Length of the upper Guts, is only partly filled with thin Matter, or almoſt empty, the Steam will have freer Vent, the Stomach ſettle, the inward Heat abate, and the Blood move quicker. And when the Glands which ſecrete the Juices for diſcharging the Excrements are emptied, the Lacteal Veſſels may extend, and be opened wider, and let the Steam paſs in greater Quantity.

SECT. VIII.

——*Which hinder the Steam from paſſing, &c.*

THE Craſſneſs of the Steam, or its being loaded with Matter not ſufficiently divided in the Stomach or Guts, the Craſſneſs of the Matter in the Guts, which ſtops or clogs it as it paſſes through, the Phlegm upon the Sides of the Guts, the Straightneſs of the Lacteal Veſſels, or their being ſtopped with phlegmy Matter, the Craſſneſs or Thickneſs of the Blood, the Weakneſs of the Muſcles of the Heart or Valves, which lets go the Steam before it be raiſed to a due Force, the encreaſing the Preſſure of the Atmoſphere or Cold, the Foulneſs of the Bladders in the Lungs, a thick foul Air, the ſtraightneſs of the Capillary Veſſels, the Craſſneſs of the Matter in them, the Straightneſs or Foulneſs of the Pores. If the Steam accuſtomarily bear off too much Phlegm, it and the Blood will move heavily, the Body will be cold, and the outward Parts of a phlegmy Colour, &c. If the Stomach and all the Guts be extended, and the Blood move not briſkly, either the

Steam is too groſs, or the Matter in the Guts is too craſs, and the Agents huff and extend them as Leaven does Paſte, or the Lacteal Veſſels are too ſtraight, or foul, or ſwelled, or ſtopped by the Fulneſs of the Glands, &c. or the Blood is too craſs, or thick, or tough, and the Meat will be a long Time in digeſting and going off. If the Steam riſe not in Quantity ſufficient, or be obſtructed, ſo that the Blood move weakly, the outward Parts will be lank, and the Skin flabby or wrinkled.

SECT. IX.

—*Which ſtop the Paſſages in the Guts, or ſhut their Valves.*

THE Sides of the Guts being clogged with tough Phlegm, and they thereby ſtraightned, or large Maſſes of Phlegm going off from the Stomach at once, and making almoſt total Stops, the Toughneſs and Ropineſs of the Excrements being not ſufficiently digeſted, the Coldneſs and Toughneſs of the Phlegm and Excrements, which raiſes little Steam, but entangles and weakens the Agents, which ſhould extend the Guts, and ſuffers the

Blood and Juices to fill the Veſſels and Glands in the Sides of the Guts, and thereby contract and ſtraighten the Guts, and ſwell and ſhut the Valves, and hinder the Agents from opening the Mouths of the Glands, and the Juices from iſſuing for Digeſtion and Diſcharge; or the Thickneſs or Thinneſs of the Blood, or the Straightneſs or Foulneſs of the Ducts, which hinder the Juices from ſecreting into the Glands in the Stomach or Guts, or dry blunt Corpuſcles which abſorb or blunt thoſe Juices, and hinder their Operation, or ſtop the Mouths of the Glands; or ſtiptick Corpuſcles which dry or ſcorch the Valves of the Glands, the Steam and impelled Juices within the Ducts and Glands; which extend and ſwell the Parts for want of Diſcharge, the violent Fermentation of the Stomach, which bears off all the Humidity out of the Guts, and leaves the Excrements dry; Heat with Action or Motion of the Parts, or Body by Fire, Cover with Clothes, lying too long or too hot in Bed, Spirits, moſt Bitters, and every thing which encreaſes Heat, or goes off in hot quick Steam, and carries the Fluids too quickly off. If the Matter in the upper Guts be too craſs and thick or dry, that the Steam cannot pervade or diſſolve it, the Stomach may extend, and the lower Guts may not. If there be one or more Stoppages in the upper Parts of the Guts, by great Quantities of Phlegm gone off the Stomach in Maſſes, the Stomach and Guts above may be extended, and the Pulſe abated, and the Steam may force upward, open the Valves, and make you vomit. And as ſoon as the Fluids are gone off in Steam from the Excrements below the Stop, or any of the Excrements are diſcharged, which rarely happens in Quantity while there is a Stop, the Guts below will be lank, and as often as the Steam above breaks through or forces by the Stop, or the Fluid ſucceeds it, into the vacant Room in the Guts below, it cauſes a grumbling Noiſe as it paſſes along. This Noiſe may happen at the Valve of the *Pilorus* or *Colon*, or in paſſing by the ſolid Excrements below, but not in the ſmall Guts, unleſs they be twiſted or ſtopped. Keeping the Stomach too much or too long diſtended, ſtretches the ſmall Veſſels that conſtitute the Sides ſo much, that filling or extending them with Blood, Juices, &c. will not contract the Stomach to the uſual Degree. Some have thought that when there is a Stop, or any other Cauſe, which makes the Stomach extend too much, it may make it preſs the great Artery behind it, and hinder a due Proportion of the Blood from deſcending; but if the Stop be not near the Stomach, and there be no great Obſtruction in the Paſſage of the Steam, the ſame Force which extends the Stomach, extends the Artery, and drives the Blood. But if there be an Obſtruction near the Stomach, and the Steam iſſue not out in due Proportion from the Stomach, or from the Guts below the Stop, the Blood will move ſlowlier, and the Preſſure of the Atmoſphere will prevail over the Strength of the Steam, and preſs a greater Share of the Blood into the inward Veſſels; and though indeed the Blood will be leſs expanded, or in leſs Compaſs, yet perhaps the Arteries will be more diſtended than when the Steam iſſues briſkly, and the due Share of the Blood is outward. * See above, p. 112.

SECT.

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* This ſeems to be a more mechanical Account of the common Apoplexies than that from a Repletion of the Stomach, and its Preſſure upon the *Aorta*.

SECT. X.

—— *Which open the Paſſages in the Guts or their Valves.*

SOME Juices involuntarily ſecreted or diſcharged out of ſome peculiar Glands, out of the Stomach or Guts, or out of the Gall-Bladder, *Pancreas*, or perhaps from ſeveral of them jointly, or from ſeveral Parts for the ſeveral Valves which open the Mouths of the Glands in the Guts, as they deſcend and let out the Juices and Steam which inſinuate between the Plaits of the Valves, and make way for the reſt, or that opens the Mouths of the Glands of the Valves, and makes them ſecrete the Juice, and Steam which ſwelled and extended them, and at once leſſen their Magnitude, weaken their Force, and by the iſſuing, Juice and Steam, repell their Inſides from one another; and as the Juice and Steam iſſues and empties, the Glands at once expand the Guts, ſuffer them to extend or widen, and makes all their Sides ſupple. During this Action, you feel a ſoft Tickling deſcend all along down your lower Guts, and the Force of the Steam is employed to diſcharge, and the Force of the Muſcles which move voluntarily. The hard Excrements of every Creature, when they are diſcharged, have more or leſs of theſe Juices on their Outſides, and after they are diſcharged, generally a ſmall Quantity of thoſe Juices follow; when the Excrements are diſcharged ſoft, thoſe Juices are mixed and not ſo viſible, tho' 'tis likely they are in greater Quantity. 'Tis ſaid ſome People collect the Juices which are diſcharged after, and ſwim upon the Excrements of Cattle in *May* or *June*, and drink it to purge them, and that it does it effectually. All Creatures ſtrain to diſcharge thoſe Juices after the Excrements, and if a Man do not diſcharge them, they will in Time occaſion the Piles. I pretty much doubt whether it be the Excrements which remain in the Guts, or the volatile Juices and Salts diſcharged out of the Blood, which ſmell when they are diſcharged by Stool. I think when one is coſtive, and few Juices diſcharge out of the Blood, the Excrements ſmell little or ſcarce at all. In healthy Perſons, where there are no accidental Motives, nor Impediments, 'tis likely the Glands ſecrete regularly, according to the Rules aforeſaid, and when they are full, diſcharge almoſt periodically. And as thoſe Juices are ſometimes diſcharged other Ways, or obſtructed in ſecreting into or out of the Ducts or Glands, and are too few or too inactive, or meet with Phlegm or Obſtructions, which entangle or blunt them, or defend and keep them off the Parts where they ſhould act, ſo on the other Hand, they ſecrete into and out of the Ducts, Veſſels, or Glands too faſt, in too great Quantity, or are too active, or there are other Juices in the Stomach or Guts which they excite, or the Mouths of the Glands are too open or too naked and defenceleſs, or too much opened, or they ſecrete too much, or too active Juice alſo, or the Steam is too ſtrong, and hurries off the Excrements too faſt, and ſometimes the Juices wound the Glands, till they diſcharge even the Blood itſelf. The Juices may become too ſharp or ſalt by the Straightneſs of the Ureters, &c. which will not let a due Share of them paſs. And when the Blood is ſaturated with ſuch Juices, the Glands will ſecrete them into the Stomach and Guts. And in a Morning when your Stomach is lank, and you lie upon one Side, you will feel a burning, gnawing Heat on the under ſide of your

Stomach, and the Steam will go off hot, and cauſe a burning Heat in the Parts, and the Steam ſo loaded with Salts, will open the Mouths of the Glands in every Part where it paſſes, make them ſecrete continually too much, and ſo by Degrees emacerate the Body. If they bear too great a Proportion of Oil, they have the contrary Effects. The Excrements can be fermented or mixed with Juices, till they be exceeding ſharp and hot in the Guts, and that they ſcorch or fret the End-Gut and Fundament as they are diſcharging, and 'tis likely they can open the Glands in all the Valves, and with the Aſſiſtance of the Steam, force their Way till they are diſcharged; but whether the Excrements can be fermented to ſuch a Degree, that the Corpuſcles freed out of them, without a Mixture of the Juices ſecreted out of the Blood, can open the Glands in the Valves, and aſſiſt in diſcharging themſelves out of the Stomach, or any Part of the Guts, I cannot tell. When one has a free continued Looſeneſs, the Excrements are whitiſh, and either ſome white Juices return out of the Blood, or the white Juices we call the Chyle, are not diſcharged out of the Excrements, or the Excrements are of that

Colour, when they are fermented to ſuch a Degree, and are diſcharged at that Degree, like Ale, which is white when working, and after brown. When ſuch a Looſeneſs has continued for ſome Time, ſo that the Tenſion of the Guts is weakned, the outward Parts will be contracted, the outward Veins viſibly ſtraightened and made ſmaller, and the Kidneys being leſs compreſſed by the Steam within the Guts, and the Veſſels and Glands in them being ſuffered to extend, they will ſecrete the Urine thick and muddy, and 'tis likely the Liver and *Pancreas* being leſs compreſſed, will ſecrete a greater Quantity of Juices, or Juices of a groſſer Conſiſtency, and 'tis found by Experience, that the Corpuſcles in ſeveral ſorts of Meat and Drink, in Simples, Minerals, &c. ſtop the Glands which iſſue the Juices to open the Valves, or entangle or abſorb the Juices or Agents which are called by diverſe Names, *viz.* - - - - - - - - And the Corpuſcles in others open their Mouths, or excite ſome latent Juices in the Stomach or Guts which open them, and make them diſcharge their Juices and diſcharge their Excrements, which are alſo called by various Names, according to the Quantity of Corpuſcles in each, or the Quantity

Abſorbents, Encraſſants, Agglutinants, Bracers, &c.

Quantity given at once, as Openers, Purges. And when the Glands have been ſtopped for any conſiderable Time, upon their being opened, the Juices will flow up in greater Quantity, and have more forcible Effects. And when they have been forcibly opened by Phyſick, or any other Accident to ſecrete their Stock of Juices, and what would afterwards paſs out ot the Blood, they ſecrete not naturally for ſeveral Days. And the ſame Agents have the ſame Effects upon the different Parts of the Body, outward or inward, in Proportion to the Degree of Force which moves them, the Thickneſs or Thinneſs of the Skin or other Defence, the Strength or Weakneſs of the Glands, the Wideneſs or Straightneſs of the Valves, Pores, &c. And different Agents or different Quantities, or moved with different Force, open the Valves or Pores, and let the Juices be preſſed out in any Part; ſome, thoſe in the Mouth to diſcharge the *Saliva*; ſome, thoſe in the Stomach to diſcharge the Bile; ſome, to bliſter or take off the outward Skin, &c.

SECT. XI.

—— *Which open the Paſſages and Valves where the Urine ſecretes.*

COLD Meat, or weak ſpiritleſs cold Liquor, which abates the Steam in the Guts, takes off the Preſſure upon the Kidneys, lets their Ducts open: cold Air which ſhuts the Pores, and prevents the Fluids from perſpiring, Salts or ſharp Corpuſcles which cleanſe the Glands in the Kidneys, and ſo render them wider, or which open the ſmall Glands in the Sides of thoſe Paſſages, and make them ſecrete the Juices in them, and thereby render the Paſſages liable to be extended or widened by the Fluids and Steam, and enable them to diſcharge the Phlegm, Salts, Gravel or Stone, which ſtopped or ſwelled, or ſtraightned the Parts, and afterwards thicker Urine. There are acid Corpuſcles in ſome Fluids like thoſe in Rennet, which by their Smallneſs or Figure ſeem to be adapted to divide or thin Fluids, and let the groſſer Corpuſcles ſubſide and precipitate, and thereby render the Fluid thinner, and more liable to be ſecreted by Urine. When the Water is ſecreted into the Bladder, and we open the Valve in its Neck, which ſeems to be done partly voluntarily, the Steam in the Guts preſſes it out, puſhes down the End-gut (and if it be open) breaks backward; and when it gets Vent in Quantity, the Water iſſues weakly. When the Steam preſſes the Excrements, and gives us an Inclination to a Stool, the Preſſure of the Steam, which riſes to diſcharge the Excrements, preſſes the Bladder, and gives us an Inclination to diſcharge the Urine; we diſcharge the Water firſt, and that gives the End-gut Liberty to extend farther, and make Paſſage for the Excrements. When theſe Paſſages are too wide, or open, they drain too much of the Fluid thin Parts out of the Blood, and carry off the Juices, which ſhould be reſerved for other Uſes, and quickly diſorder all the Operations in the Body.

SECT. XII.

—— *Which ſtraighten or ſhut the Paſſages or Valves, when the Urine ſecretes.*

THE Extenſion of the Steam in the Guts, which compreſſes the Kidneys, and ſtraightens the Ducts, the free Paſſage of the Steam, and Openneſs of the Pores, which diſcharges moſt of the Fluid that Way, Phlegm or any Sort of glutinous Meat or Drink, which fouls, or Salt, Gravel, Stone, &c. which corrodes or frets the Glands till they ſwell, Abſorbents or blunt Corpuſcles, which hinder the Agents from opening the ſmall Glands in the Sides of the Ducts. When the Steam is ſo ſtrong in the Guts, that it not only prevails againſt the Preſſure of the Air, but extends and ſtretches the Muſcles of the Belly outward very much, the Blood being reſiſted only by the Strength of the Preſſure of the Air, and the Skin in the outward Parts, a greater Share of the Blood will paſs that Way, and leſs through the Kidneys. The Kidneys will be violently compreſſed between the Sides of the Guts, by the Expanſion of the Steam in them; and the Arteries, Veins,

Hence the Diſorder commonly called the Windy Gravel.

Veins, Ducts and Glands in them contracted and ſtraightned, the Water will paſs thinner conſequently, and in leſs Quantity. When any conſiderable or total Stop is made there, or in any of the Paſſages for the Urine below, the Blood-veſſels are preſently filled too full, the Blood becomes of a Conſiſtency not fit for Circulation and Secretion, the Steam cannot get Vent for want of Space to move the Blood in, but recoils, throws up the unnatural Juices ſecreted into the Stomach, cauſes Vomiting, and at laſt Fevers, &c. The Milt, or Spleen, ſeems to be under much the ſame Circumſtances as the Kidneys, liable to be extended when the Steam in the Stomach and Guts is weak, and compreſſed when it is ſtrong: Whether the Pain there be occaſioned by its Extenſion, when the Steam is weak, or Compreſſion, when the Steam is ſtrong, I have not had Opportunity to obſerve: Nor whether the Diſcharges out of the *Pancreas* be occaſioned by the Weakneſs of the Steam in the *Duodenum*, and the Extenſion of the Steam in the other Parts, or by the Weakneſs of the Steam in all the Parts, or the Juices are preſſed out of their Glands by the Strength of the Steam in the Stomach, or jointly in the Stomach and Guts. Whether the Liver, which is chiefly ſupplied with Blood by the Preſſure of the Atmoſphere, when it is compreſſed by Steam, in the Stomach and Guts, ſtronger than the Preſſure of the Air, admit a due Share of the Blood to return from the lower Parts of the Body through it, or deny Admiſſion, and keep the lower Parts extended and too full, or whether it then circulate a due Quantity of the Blood in itſelf, and ſecrete a due Quantity of Gall, and whether, when the Steam within is weak, the Liver do not extend, admit a greater Quantity of Blood, and ſecrete a greater Quantity of Gall, whether its Extenſion cauſe not that Preſſure we ſometimes feel about the Stomach; whether it diſcharge the Juices out of the Gall-Bladder, when the Tenſion of the Guts is weak or ſtrong, I cannot tell. But 'tis likely if thoſe Juices be intended to encreaſe the Ferment, they are contrived to diſcharge when it is weak, if to abate the Ferment, to diſcharge when it is ſtrong.

SECT. XIII.

A State of the Operations in an healthy Perſon, how varied when empty, full, &c. In the various Poſitions of the Body in Reſt, in Action, the various Effects of Meat, and Drink, compoſed of different Sorts of Corpuſcles, or differently freed.

WHEN you have an Inclination to eat and drink, you feel a Lankneſs, Laſſitude or Feebleneſs in all the outward Parts, and a Gnawing or Sharpneſs within the Stomach; the firſt occaſioned by the Defect of Steam to move the Blood quickly, and diſtend the Parts; and the latter by a brinous or ſalt Fluid remaining at the Bottom of the Stomach, which remaining in the Glands, and ſecreting out of them, fall down to the Bottom of it, and raiſes the Senſation of Hunger, or what we call our Appetite. Suppoſe there is ſome ſmall Quantity of Phlegm lodged in the Stomach, or ſwimming upon that brinuous Matter, that the Guts, or the ſeveral Diviſions of them are partly filled, the lower Parts of undigeſted craſs Matter in Form of Excrements, and the upper Parts of a thinner Matter compoſed Part of excrementous Matter and Part of Fluid, and the uppermoſt Parts of Steam or empty, and the whole mixed with Salts, the Juices of the Gall, Pancreatick, &c. And that the lower Parts are extended with Steam, and hang in Folds or Bends, like Bags, and that the Stomach, upper Guts, &c. are lank, contracted and compreſſed by the Extenſion of the Guts below, into a little Compaſs, ſuppoſe the Body ſtanding, or ſitting at Reſt, the common Quantity of Meat you chew and ſwallow, is mixed with the *Saliva*, goes down into the Stomach, and reſts in a Maſh upon the Phlegm and brinous Fluid, if there be any conſiderable Quantity of the brinous Fluid, the Meat and Phlegm partly immerſes in it. When you have drank the common Quantity of any thin Fluid ſufficient to dilute the whole, if the Fluid be warm, moſt of the Oil or melted Fat (if there be any) riſes to the Top, moſt of the Phlegm next under it, next the Parts of the Meat which will ſwim in that Fluid, and next the Fluid with the Parts of the Meat near its own Gravity, hovering or ſettled to the Bottom in it. If the Fluid be cold, the Oil and Steam will be ſtorkened and entangled among the Maſh, till the Steam and Heat thin them; Part of the brinous Matter will be entangled in the Oil, Phlegm and Meat, and Part diſperſed in the Fluid, (which will ſheath, or diſperſe the Salts, and take away the Senſe of their gnawing upon the Bottom of the Stomach) in the ſame Order as they would be if they were put into a Bag kept in the ſame Degree of Heat, and moved with ſuch a Motion as the Lungs give to the Stomach. When the Salts are ſo diſperſed they free others, and by Degrees open moſt of the Glands in the ſides of the Stomach, and 'tis likely the brinous Juice continues to ſecrete, till the Ferment extend the Stomach, and put a Stop to the Secretion. When you have filled the Stomach too full, or overcharged it, ſo that the Agents or Juices cannot riſe into Steam in a ſhort Time, or if you quell them when they are begun to act, it will make too great a Quantity of Juices iſſue into the Stomach, and at laſt raiſe too great a Ferment, and cauſe too great an Extenſion.* For a little

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* It is highly probable, that the Shuddering or Horripilatio preceeding all Fevers and acute Diſorders, proceeds from this ſame Cauſe, and not from the Obſtruction of the Capillary

while after we have eaten and drank, we find a Coldneſs in the outward Parts, and a Heavineſs or Inactiveneſs in the whole Body, becauſe the Corpuſcles of Cold in the Meat and Drink put a Stop to the Steam, and condenſe it totally in the Stomach, and partly by Pervaſion in the Guts. A while after, as ſoon as they have fermented a little, the moſt volatile or lighteſt Parts go off in Steam, extend the Parts, thin the Blood, and put it into Motion, and give a Lightneſs, Briſkneſs, Heat and Strength to the whole Body, and ſets forward the ſeveral Secretions at the Lungs, Pores, Ureters, &c. At the beginning of the Ferment, as I ſaid, the moſt volatile Parts go off in Steam; when the Ferment is high, the volatile Parts go off full loaden, eſpecially if there be much Meat, and ſo prevents too great an Hurry in the Blood; when the Ferment abates, it goes off leſs loaden, and more able to move the Blood, and ſo keeps the Motion nearer equal, though it does not expand the Parts ſo much. If one have reſted long in a cold

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Capillary Veſſels, as is generally taught; their firſt Symptoms manifeſtly ſhewing the Attack to be begun in the *Primæ Viæ*, and perhaps then is the Struggle with the Agents, as Sickneſs, Nauſea, Vertigo, Vomiting, Griping, Diarrhœa, &c.

cold Place till one's outward Parts are very cold, and one eat and drink in that Condition, ſoon after the Stomach and Guts will extend very much, becauſe the Steam cannot ſuddenly thin the Blood, extend the outward Veſſels, open the Pores, and get Paſſage as it does when the Body is warm. As the Meat at the Bottom diſſolves in the Fermentation, the Corpuſcles and Fibres of it ſtill riſe up into the Fluid, and poſſeſs each their ſeveral Place according to their Gravity, till the Fermentation thin, and the Steam bear off almoſt as much as it can, and it begin to abate, the Blood and Juices preſs into the Sides of the Stomach and contract, and the Steam in the Guts below lifts up its Bottom, and the Maſh, as it comes to the Level of the *Pilorus*, is diſcharged into the Guts, and the Remainder (which in an healthy Perſon I think is very little) ſubſides and lodges in the Bottom of the Stomach, and every Thing becomes in the ſame State as when you firſt began. When one lies down with a full Stomach, ſeveral Poſitions alter the Caſe. If one lie upon the right Side, the Matter, which in a ſtanding or ſitting Poſture was at the Bottom of the Stomach, will then be upon the right Side of the

Stomach, and upon the *Pilorus*, the reſt ſucceeding each in their Order, (and the Phlegm and Oil uppermoſt) towards the left Side of the Stomach, and the Vacancy extended with Steam there. When one lies upon the left Side, the Contents of the Stomach are inverted, and the Vacancy extended with Steam is on the right Side, and to the *Pilorus:* When upon the Back, the Parts of the Contents, which poſſeſt the lower Place, ſettle thither, and thoſe which emerge to the foreſide of the Stomach then uppermoſt, and the Vacancy filled with Steam is on that Side, and the Fluid lies with one Side to the *Pilorus.* If one lie on the right Side, the heavieſt Maſſes of the Meat may go down firſt undigeſted into the Guts: If on the left Side, nothing but what goes off in Steam can go out at the *Pilorus*, till the Stomach be lifted up, and contracted: If upon the Back, the Steam may go off above, or through the Fluid out at the *Pilorus*, much in the ſame Manner as when one ſits or ſtands. When the Meat and Fluids are digeſted, and gone off, if any of the brinous Matter remain, or be ſecreted in conſiderable Quantity into the Stomach, it corrodes, and cauſes a burning Pain on the Side of the Stomach you lie upon, which is not ſo able to endure it as the Bottom of the Stomach. If one lie on the right Side they may go off at the *Pilorus* into the Guts, paſs with the Steam, and cauſe a burning Heat all over the Body. If there be much cold Phlegm remaining, it preſſes and lies more uneaſy upon any Side of the Stomach than it does at the Bottom. And if one lie upon the right Side, if the *Pilorus* be open, it may go off, ſtop in the Guts or in the Mouth of the *Pilorus*. When the Side of the Stomach that lies undermoſt is uneaſy, we naturally change Sides. I think Cattle conſtantly lie upon their right Side. It deſerves Conſideration why they all lie on one Side, and Obſervation how their *Pilorus*, &c. is placed; how other Creatures lie, &c. and alſo how the Lungs, Liver, &c. preſs upon the Veſſels, in which the Steam paſſes from the Guts to the Blood-veſſels, when one lies upon the left Side, which is ſuppoſed to be the Cauſe why one ſometimes riſes ſo oppreſt. Whether a Quantity of Phlegm be neceſſary to remain in the Stomach when the reſt is diſcharged; or, whether any of the Glands of the Stomach ſecrete a mucous Matter to prevent the ſharp brinous Matter from corroding the Stomach, when one faſts long; and whether that raiſes any conſiderable Steam, or the Fluids in the Guts ſupply the whole, deſerves to be conſidered. Since a Man may faſt till his whole Body be almoſt waſted away, it ſeems very likely, that ſuch Matter is ſecreted into the Stomach, and there diſſolved till it go off moſtly in Steam. If the Coats of one's Stomach and Guts, when irritated by Salts, or &c. can diſcharge Juices in the ſame Quantity, as the Glands in our Mouths when irritated can, the Proportion of their Extents conſidered, there may be ſeveral Pints ſecreted into one's Stomach and Guts in an Hour. Perhaps when one ſits ſtill, or uſes very little Exerciſe for ſome Time, the lighteſt volatile Matter, which aſſiſts in digeſting the Meat, for want of being toſſed and mixed with the Meat by Exerciſe, goes off too ſoon, leaves the Meat undigeſted, and occaſions what we call Vapours. And when there is a great Quantity of Steam raiſed from the Stomach, and ſecreted through the Brain into the Nerves, and not diſcharged by Action of the Muſcles, it may diſtend them too much, or make Obſtructions to the Secretions there, and diſorder the Senſe of the Brain. Whether the Matter which occaſions thoſe painful Swellings, &c. which we call the Gout, and ſome nearly reſembling it, be lodged in the Blood-veſſels, or Nerves and Muſcles, I have not had Opportunity to obſerve and diſtinguiſh. When the Body is put into Motion by riding, or into Action by walking, running, or any ſort of Exerciſe, the Matter in the Stomach and Guts is toſſed about, inverted and mixed, and the Fermentation mightily encreaſed, and the Steam emitted in greater Quantity, and with greater Force, in Proportion to the Motion or Action, and it circulates the Blood with greater Speed, quickens the Motion of the Lungs, makes a greater Diſcharge of Steam there and at the Pores; in violent Exerciſe, eſpecially if the Party uſe it not frequently, and the Parts be not widened by Uſe, enflames and extends the Body, ſending out the Steam faſter than the Lungs and Pores can diſcharge it; and if the Matter that ſupplies the Steam be ſufficient, and the violent Exerciſe continued, at length the Parts will be ſo extended with Steam, that ſmall Quantity can iſſue out of the Stomach and Guts, and they will extend, ſtretch the Midrif, and cauſe Stitches; the Blood will be diſabled from circulating,

ting, a Stop put to our Motion, &c. till by reſting, the Steam by Degrees get Vent at our Lungs, Pores, &c. and afterwards from the Stomach and Guts; and as that is effected, the Blood by Degrees circulates, the Heat abates, our Strength recovers, &c. The Stomach and Guts act like a Still; when there is not Heat enough, it runs Water; when enough, Spirits; when too much, Spirits and craſs Matter; when there is very much Heat, or the Pipe ſtopped, the Head flies off, or it burſts. As moderate Exerciſe taken gradually heightens the Ferment of our Stomach, removes the Obſtructions in the Veſſels, opens the Pores for Perſpiration and Reſpiration, ſo the Strength of our Body is in Proportion to the Quantity and Duration of the Steam, which the Stomach and Guts can emit, the ſeveral Tubes admit, and the Lungs and Pores diſcharge, and never fails, till the Guts fail of ſupplying, or the Nerves or Muſcles of ſecreting, admitting and remitting, or the Lungs and Pores of venting them. And when any one of them fails, it fails in Proportion; if ſo, little more need be ſaid in Commendation of moderate Exerciſe. And though a Man by cleanſing his Body at firſt, and uſing proper Diet, viſcous Meat, and old well mixed Drink, whence the Steam riſes regularly and equally; and takes this not all at once, and little or no freſh food before the laſt be digeſted and born off, with Sweats and Action, by Degrees may bring his Stomach to ſupply, and open the Paſſages, and Pores to tranſmit and diſcharge ſufficient Quantity of Steam to enable him to endure long and violent Exerciſe; yet if a Man, whoſe Body is not ſo prepared, uſe violent Exerciſe, it will throw out the Phlegm or what is in the Stomach, into the Guts, and the Steam will extend the lacteal Veſſels, force cff Phlegm or craſs Matter, when 'tis melted or divided with exceſſive Heat into the Blood; and the Violence of the Motion of the Steam, and the Corpuſcles of Fire and Salts in it, will tear off and diſſolve, or melt the Fat or tender Parts of the Body, and bear off too much of the Serum, or finer Parts of the Blood; ſo that when he comes to reſt, and that Matter in the Blood to cool and ſtorken, the common Force of the Steam will not be able to circulate it in the Blood, nor force it through the Capillary Veſſels, nor ſecrete it by the Pores, Ureter, &c. During Sleep or Reſt, ſome of the Matter will be thrown off by the

Lungs, foul the Tongue, and make it white, and the craſſeſt of the Matter will ſtop in the Capillary Veſſels, and moſt commonly fall down upon the Legs, cauſe Swellings, Dropſies, &c. and if there be any Quantity of acrid Matter, or ſharp Salts in it, cauſe Pains, Inflammations, &c. and ſometimes Stoppages and Pains in the Side, which they call Pleuriſies, &c. and if in leſs Degree, make the Blood move heavily, the Perſon dull, &c. * Whether that flackering Motion, we ſometimes feel in our Parts, be Air collected together, ſo that when puſhed by the Steam it recoils by its Elaſticity, or whether 'tis ſome Steam that gets Vent out of the Nerves or Muſcles irregularly, or whether 'tis ſomething that the Steam has born off when it was too high, or when there were ſome Stoppages, deſerves to be conſidered; whatever it is purging takes it away. When one is violently heated by Exerciſe, drinking any conſiderable Quantity of ſtrong Spirits, raiſes the Steam more, and heightens the Flame. While ſpirituous briſk Steam goes off, little Sweat hangs upon the Body; when it

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* The Aurarefrigerans, or that wonderful Prænuntium of Epileptick Fits, hitherto unexplained, and even unattempted, ſeems of this Kind.

it is ſpent, the Sweat is cold and watery; and afterwards there iſſues little or no Sweat. If when hot with Exerciſe, one drink ſtrong old Beer, or Ale cool, where the Spirits and vegetable Matter are well mixed, though at firſt it cauſe a little Stop, the Spirits by Degrees go off, and keep all going; but if thin weak ſpiritleſs Liquor cold, the Corpuſcles of ſuch Cold, Fluid, clog the Corpuſcles of Fire, Salt, &c. and ſtop or condenſe the Steam ſuddenly; the Air preſſes Corpuſcles of Cold in at the open Pores, the Blood and great Quantity of Matter in it thickens and ſtorkens for Want of Steam to thin, drive and ſecrete it, and if not ſuddenly aſſiſted by hot Spirits, Action, Friction, or Heat ſtagnates, ſettles upon the Parts, and overſets the Frame. When, in Action, one drinks Water cold, it condenſes the Steam in the Stomach, and makes the Glands ſecrete, and thoſe Juices bear off the Water which does not entangle them, as cold Juices, &c. do, and makes one Sweat preſently; partly by the Humidity of the Steam, but chiefly for Want of Strength to bear it off the Skin. Reſting ſuddenly from ſuch violent Action in cool Air, has frequently the ſame Effects as drinking cold weak Liquor; and in leſſer Degrees of Heat by Action proportionable Effects. And one who has for ſome Time uſed violent or conſiderable Action, and afterwards on a ſudden uſes little Exerciſe, or Reſts, will find ſome ſuch Inconveniences. And one who has been accuſtomed to drink much ſtrong Drink, and eat high Food, and afterwards on a ſudden uſes weak Drink and Diet, will find the ſame Effects, and the Steam will not be ſtrong enough to circulate the groſs Particles forced into the Blood-veſſels by violent Exerciſe, ſtrong Drink, &c. * And if the Steam in the Stomach be ſo weak, when there is any Matter in the Blood which is offenſive, that the Preſſure of the Air without can drive a great Quantity of it thither, it cauſes Diſorders, which they call Gout in the Stomach, &c. and is expelled, by heightening the Steam in the Stomach, by ſomething which is ſtrong and aſtringent, to keep that out which is out, and expell that out which is in. Removing

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* And this is a clear and mechanical Account, not only of the Gout, but of all Diſorders, whoſe ſalutary Criſes are made by Eruptions or Efflorefcenſies ; and whoſe fatal Exit depends, either upon want of this Steam to help them out, or (what from this appears moſt plainly) any ſudden Check overpowering it, which drives them back, i. e. the Matter forming them.

Removing from Place to Place, Motion of the Air, &c. prevent one's drawing the Air, one has breathed, and gives one Opportunity to breath freſh. But I think, there is this Difference between Agitation of the Body by riding, &c. and Action of the muſcular Parts of the Body; that riding daſhes the Contents of the Stomach againſt the Sides, makes the Juices ſecrete, encreaſes or raiſes Steam from the Contents of the Stomach, faſter in Proportion than it opens the Pores, &c. to diſcharge it, than muſcular Action does. Action, eſpecially of the Arms and Body, not only raiſes the Steam, but by the Stretches and Contractions of the Muſcles of the Belly, &c. as one may ſay, ſqueezes the Steam out of the Stomach and Guts, and employs it, not only to circulate the Blood, but to diſtend the Muſcles, and emits or perſpires a greater Share of it through the Nerves, than Riding does. And all the Parts which ſqueeze the Glands in Action, as the Armpits, Joints, &c. iſſue a greater Proportion of Juices than they do in Riding. Walking gently without any Action of the Arms, or Body, does not renverſe the Contents of the Stomach, nor daſh it againſt the Sides, nor contract and diſtend the Muſcles of the Belly, &c. and will make one ſaint or tired ſooner, than five times the Exerciſe would do, where the Steam is raiſed and ſqueezed out by the Action of the upper Parts, Muſcles of the Belly, &c. I know it has been ſaid, that Walking does not diſtribute the Blood equally to all Parts of the Body, and ſo for Want thereof we become faint. But if one employ the Arms and Muſcles of the Belly to the ſame Degree of Strength, and let the lower Part ſit ſtill, one will not be faint in twice the Time. And though Riding may perhaps be of Service to People in ſome Circumſtances, yet it will never bring a Man to that Strength and Ability to endure violent Exerciſe, as muſcular Action will. And theſe Differences ought to be well conſidered by thoſe who chooſe Riding, or Walking, or bodily Action to preſerve or recover their Health or Strength. * The Effects of Drink with common Action are different, according to the various Compoſitions and Quantities. Water, if pure, is only a ſimple Fluid, and ſerves for diluting other Matter put into the Stomach. If too little of it, the Agents cannot act freely in Fermentation, but will ſplutter and huff

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* And alſo by Phyſicians when they preſcribe Exerciſe.

huff like fermented Dough. † And too much of it removes the Agents to too great Diſtances, and weakens their Power in Action; and the Corpuſcles of Fire, Salts, &c. are not able to bear it all off in Steam; but when they they have born off as much as they can carry with them, the reſt remains a cold inactive, ſpiritleſs Fluid, and moſt of that which goes off, ſecretes by Urine, little by Steam at the Pores, and the Steam moves ſlowly, and drives the Blood ſlowly. If a due Quantity, as it has little in it to ferment, or for the Salts to work upon, or be ſheathed in, their Action will be upon the Meat. Liquors, that have a great Quantity of Spirits, in a thin Fluid, ſuffer freely, and aſſiſt the Agents to diſſolve the Meat, and riſe into Steam quickly, thin the Blood, and make it move briſkly, ſupport the Parts by extending them, make the Body light for a while, and go off in a ſhort Time. Liquors, that have a great Quantity of Spirits, duly mixed with a good Quantity of vegetable Matter, and incorporated ſo, that they go off together, taken with Meat at the Beginning, ſheath the Agents, and looſe the

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† Qu. Whether this be not the trueſt Account of the ill Effects of too frequent Tea and Coffee drinking.

Appetite, and ſlacken their Force, that they cannot diſſolve ſo much Meat, nor ſo ſoon; but raiſe Steam faſt enough to move the Blood quick enough for a long Time, thins not the Blood too much, ſupplies the Humours, Fluids, and Solids, which ſhould ſtay, waſtes not too much at the Lungs nor Pores, nor ſecretes too faſt by Urine, makes one ſtronger, and enables one to endure hard Exerciſe for a long Time. Groſs, heavy, ſpiritleſs Liquor abates the Activeneſs of the Agents and Juices, makes the Steam groſſer, the Stomach and Guts extend, more of the Excrements diſcharge downward, and in Time ſtagnates the Steam, makes the Blood inactive, and fall down upon the Legs. Thin acid Liquors, which have been fermented very high, or kept a long Time, and contain but a ſmall Quantity of Spirits, do not raiſe the Steam much, but open the Glands, and carry ſome Juices into the Blood, or ſecrete them there, and tho' they be drunk moderately, if conſtantly, do ſomething which occaſions Rheumatiſms, Gouts, &c. ſpirituous and ſharp Liquors, ſuch as old thin French Wine, Champain, &c. thin and ſubtiliſe the Juices of the Body too much, divide the Meat too ſmall, ſo that moſt of it paſſes into the Blood, and little by Stool, and when too much of that which ſhould paſs by Excrement, is thrown into the Blood, it falls upon the Feet and extreme Parts, makes them full and hot, if in great Quantity, cauſes Rheumatiſms, Gouts, &c. The Quantity of Spirits commonly taken in the other Fluids into the Stomach, being freed from groſs vegetable Matter, goes off quickly in Steam, quickens the Motion of the Blood for a ſhort Time, perſpires, and leaves the reſt, rather leſs active than before. If one drink a great Quantity of Spirits, unleſs there be a great Quantity of Fluids, or Matter in the Stomach, they riſe into Steam quickly, hurry the Blood, and detach the thinner Liquors out of the Stomach, Guts, and Blood, and drive it with them out at the Lungs, Pores, &c. and leave the Body hot, dry, and faint. If one drink ſtrong, thin Drink, when the Stomach is empty, and ſome Time before one eat, it bears down the Juices, and may make the ſmall Tubes, which compoſe the Sides of the Blood-veſſels, ſecrete their Juices, cauſe the Piles, &c. When, in a little Time, one drinks a great Quantity of ſpirituous thin Fluid, even ſo much as to affect the

Heat, ſoon after drinking it, one feels a Senſe of Chilneſs and Coldneſs in the outward Parts, the Pulſe moves quickly but weakly, and one's Strength abates. Is the firſt Steam too volatile, and goes off too quick at the Lungs? or is it the Quantity of the Liquor that abates the natural Ferment of the Stomach and Guts, and makes undigeſted Fumes go off clogged with too great a Quantity of Humidity and Phlegm? Whether it is I am not certain; but after a while one becomes hot, the Steam goes off ſtrongly, and in great Quantity, the Pulſe moves quick and ſhort, and in a ſhort Time after, one becomes feveriſh, weak and faint. When all the Blood-veſſels, are thus filled with too great a Quantity of Steam, it keeps the *Vena Cava*, great Artery, and Heart almoſt conſtantly full and ſtretched, and the Succeſſion of the Steam is ſo ſtrong and quick, that the *Vena Cava*, and great Artery, have not Time to relax and ſtretch, which gives the Heart the local Motion; nor the Heart to empty and fill, which gives it that additional Motion it has by Extenſion and Contraction, and makes the Pulſe ſlower and ſtronger, ſo the Heart beats quick, but riſes and falls little; the Pulſe moves quick, but the Arteries riſe and fall little, and little Blood ſucceeds at once; and if the Steam were ſtrong enough to keep the *Vena Cava*, and great Artery ſtretched, and the Valves of the Heart conſtantly open, the Blood would run ſmooth without moving the Heart or Arteries. Fevers may be occaſioned by too much ſtrong Drink, too violent Exerciſe, by outward Cold, cold heavy Meat, or any Thing which lets in too many Juices, raiſes the Ferment and Steam too high, and I think continued by a violent Rotation of ſharp Juices from the Blood, into the Stomach and Guts, which keeps the Steam too hot and ſharp, and ſucceſſively forces back the Matter thence into the Blood. And, I think, what they call a Fever of the Spirits, is occaſioned by Steam's being volatilized too much; ſo that which is ſecreted into the Nerves, becomes too hot and ſubtile for its Employment; and they are prevented, or ſtopped, by ſtopping the Glands in the Stomach and Guts, and preventing the Juices from iſſuing out of the Blood thither, or by abſorbing, ſheathing, or clogging the Juices, and Agents, in the Stomach and Guts, which are too ſharp, and raiſe too much ſharp Steam there. Briſk bottled Ale, or ſmall

Beer, has ſome Effects upon ſome Stomachs different from any other Liquor, which People call Windineſs, it makes the Stomach feel full, ſometimes goes ſo far, as to make one like to faint, and makes the outward Parts ſometimes hot, and ſometimes cold and clammy, the Pulſe move weakly, &c. Whether there be any real Air in it, ſufficient when expanded by Heat, to extend the Stomach and Guts, and not go off as Steam does, or whether there be ſomething in them, which irritates the Stomach, makes too great an Emiſſion of Juices into it, and raiſes too much Steam, I cannot tell; but diſcharging Wind upward or downward, gives Relief. Cold Water drank, or cool Air breathed, helps violent Action, and ſupports us under it; and a moderate Quantity of good ſtrong Wine at Night, rectifies the Stomach; though, as I ſaid of violent Exerciſe, a Man may manage his Body by Degrees, and accuſtom it to diſcharge great Quantities of ſtrong Drink, yet if one, who has not accuſtomed himſelf to drink ſtrong Drink, at any Time drink a very great Quantity, it will have much the ſame Effects as violent Exerciſe would have upon him; both being occaſioned by the too great

Emiſſion of Steam from the Stomach and Guts, only the Lungs, Pores, Neervs, &c. do not diſcharge the Steam ſo much as in Action, which makes it affect the Head and Senſes, more than Action. If one uſe violent Action, when the Stomach and Guts are full of ſtrong Drink, it will vaſtly augment the Effects, or if one go to Bed, then the Cover reflects the Heat, opens the Pores too much, makes one ſweat too much, and weakens the Parts. The moſt ſudden Inconveniencies happen, by drinking much cold weak Fluids, and condenſing the Steam ſuddenly, when the Body is very hot with Action, the Steam high, and the Juices thinned, melted, and rendered liable to paſs in great Quantities, into the Stomach and Guts; and by drinking much ſpirituous Liquor, when the Body is very cold, the Blood and Juices thickened, ſo that the Steam cannot get Vent as faſt as it riſes. To enter into a Detail of the Qualities of the various ſorts of Meats, as Bread, Fleſh, Fiſh, Fruit, Herbs or the ſeveral Kinds dreſſed, cooked, ſeaſoned after different Manners, and mixed with various ſorts of Sauces, &c. the various ſorts of Liquor, as Beer, Water, Wine, Spirits, with various Qualities, as old, new, ſweet, ſharp, bitter, ſmall, ſtrong, &c. and the ſeveral Mixtures and Compounds added to them; and the various Mixtures we make of them each Meal, would be too large to be inſerted here; I ſhall only conſider the Quantity. If you eat leſs than your Stomach can digeſt, and than will ſupply the Body with Nouriſhment, you will be light and weak, and ſooner hungry. And if you eat and drink not enough to raiſe ſufficient Steam, you will always be coſtive or ſtopped, becauſe the outward Preſſure of the Air will force the Blood and Juices, into the Veſſels and Glands, which compoſe the ſides of the Stomach and Guts, and Valves in them; ſtraighten and contract the Stomach and Guts, make the Valves ſwelled and ſtrong, and hinder the Excrements from diſcharging. If you eat more than the Agents in the Stomach, can digeſt and diſtribute, Part of it will go off craſs into the Guts, and Part remain in the Stomach undigeſted, in Form of Phlegm, imbibe and entangle the Salts, &c. and become ſour, or bitter, or putrid, and in ſuch Condition be ſucceſſively tranſmitted into all the Parts of the Body; and if this be done leiſurely, it will by Degrees overſet the Operations of it; but if, while the Juices are fit, and in ſufficient Quantity, the Matter undigeſted will abate the Steam, ſo as to let a greater Quantity of Juices flow in, or this ſour or offenſive Matter will irritate, and open the Glands in the Valves of the Neck of the Stomach, or in the lower Guts, and make Efforts to diſcharge it, upward or downward. If it be true, that Cantharides, or any ſuch hot piercing Thing, taken into the Stomach can invigorate People for a Time to ſuch a Degree, as is reported, it muſt be by opening the Glands into the Stomach, letting in the Juices, and raiſing a briſk Steam; and, perhaps, by alſo opening the ſmall Glands in the ſides of the Blood-veſſels, letting out the fine Juices, and thereby both thinning the Blood, and opening and extending the Blood-veſſels, Paſſages, &c. For 'tis certain, no vigorous Action can be effectually performed, unleſs the Steam thin the Blood, and prevail againſt the outward Preſſure of the Air. And the Steam prevails moſt in People who are not very fat, and have their inward Paſſages moſt open. Milk, I think, contains Corpuſcles of all the ſeveral ſorts of Matter, put into the Stomach, as fibrous, vegetable Matter, Oil, Salts, Spirits, &c. in a thin Fluid,

Concerning Milk as Food.

Fluid, nearly reſembling Water, ſeparated by an infinite Number of Ducts, and Glands in the Udder, of different Sizes and Capacities, for the Corpuſcles of different Magnitudes and Figures in it: While it is new, 'tis near equally mixed, but when it has ſtood a while and cools, it ſeparates, and the Oil or Cream ſwims at the Top. If the Seaſon be very hot, the Corpuſcles of Fire agitate the acid Corpuſcles in it, makes them divide the Corpuſcles of the ſeveral Kinds, one from another, and lets the groſs phlegmy Matter precipitate. A ſmall Quantity of the Juices, drained out of the Sides of the Stomach of a young Calf, commonly called Rhennet, mixed in a great Quantity of Milk, kept moderately warm, will cauſe a gentle Separation, leave the Whey thick and ſoft, and the Curd ſoft and tender; a greater Proportion of Rhennet, and a greater Degree of Heat, will cauſe greater Separation, leave the Whey thin and ſharp, and the Curd hard and tough: And it will have different Effects upon the Body, according to the Quantity and Quality of Juices, &c. it meets with in the Stomach. In young Children, &c. where the Juices are not too many, nor too ſharp, the Separation is very gentle, the Steam carries off a due Mixture, and the excrementitious Part is ſoft and tender. In aged People, where the Juices are in great Quantity, fitted to diſſolve ſtronger Food, or where they are in too great Quantity, or too ſharp, they cauſe a ſtrong Separation, make the Whey thin and ſharp, and the Curd hard and tough. And the Whey, with thoſe Juiees in it, ſometimes goes down, opens the Valves and purges, * ſometimes goes off in ſharp Steam into the Blood. The Curd, ſtays hard and tough, upon the Stomach, and afterwards clogs the Juices, makes the Steam go off phlegmy, loads the Blood, fouls the Paſſages, leſſens the Diſcharge by Urine, &c. and the Remainder goes off in phlegmy, tough Excrements. When by drinking Milk, ſoft Drink, &c. the Steam is too craſs, the Stomach and Guts will be diſtended, the Appetite loſt, the Body heavy, the Sweat hang upon one's Skin, and wet one's Linen. But upon drinking dry, old Wine, or ripe Beer, the Steam will rarify, the Stomach and Guts ſettle, the Appetite return, the Body become light, and there will be little Appearance of Sweat. Cheeſe, which has not much Salt

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* *Sydenham* upon the Uſe of Whey in Dyſenteries and Rheumatiſm.

Salt in it, clogs, and prevents the ſudden Hurry of the Steam, prevents Surfeits, Vomitings, &c. occaſioned by too great an Irruption of Juices, and compoſes the Agents, and does juſt the Reverſe of what is attributed to it, does not help, but hinder the Agents in Digeſtion. Cheeſe, that has Abundance of Salts in it, has the ſame Effect as Cheeſe, but the Salts in it have the quite contrary Effect, for all ſorts of the ſharp Salts forward Digeſtion: but chiefly Sea Salt, which is mixed with the Cheeſe, and that either joined or ſeparate, prevents ſudden Hurries of the volatile Salts, of which more hereafter. 'Tis pretty evident that Alteration of Diet, will in Time make the Juices of the Stomach blunter or ſharper, and the Steam ſtronger or weaker. Alterations either Way, ſhould be made very ſlowly; for that which is hard to digeſt, will not be digeſted by few or blunt Juices, and that which is eaſy to digeſt, will be too much digeſted, or made too ſharp, by too many, or too ſharp Juices; and that which is thrown out by a ſtrong Steam, will be too heavy to be circulated by a weak Steam; and that which is thrown out by a weak Steam, will be hurried too faſt by a ſtrong one. Whether

Of Changes of Diet. It ſhould be made gradually, and why.

ther there be not frequent Errors in preſcribed Diets, eſpecially on the weak Side, deſerves to be conſidered.

CHAP. XV.

Some Thoughts about the Cauſes of Sleep, and what is done during Sleep.

IN Order to know what occaſions an Inclination to Sleep, and what is performed in Sleep, 'tis neceſſary to conſider the Circumſtances we are in when we feel that Inclination; when we have ſlept a while, and when we have no farther Inclination. One has almoſt conſtantly an Inclination to ſleep, as ſoon as one has eaten and drunk too much, for then the Juices, Corpuſcles of Heat, Salts, &c. will for a little Time be entangled, and ſheathed in the Meat, or be divided and overpowered, ſo that little Steam will go off, and one becomes dull, heavy, &c. When there is a great Quantity of cold Phlegm lodged in one's Stomach, Guts, &c. which hinders the Agents from ſending out ſufficient Steam, to circulate the Blood, &c. When long, or violent, Action has waſted the Steam, and left not ſufficient to circulate the Blood, extend

The Times when one is generally inclined to Sleep.

tend the Parts, &c. When one has ſat, or laid ſtill a good while, without Action of Body or Mind, ſo that the Fermentation is not aſſiſted by Motion or Action, and the Steam moves weakly: When one has been inactive a good while in a hot Place, that the Pores are open, and the Steam perſpires too much, or too much of the finer, thinner Steam: When one has ſat long in a crowd of People in a cloſe Place, ſo that the Air which goes into the Lungs is full of Heat and Steam, does not diſcharge a due Share of the Steam out of the Lungs, eſpecially of the Heat, and that opens the outward Pores, and perſpires too much there. Some People have a great Inclination to ſleep when they are almoſt drunk; whether the Liquor overſets the Ferment in their Stomachs, or the Steam is emitted faſter than it can be diſcharged, and hinders Circulation, &c, or more, or craſſer is ſent into the Head, than is neceſſary for the Nerves, I cannot determine. We need moſt Sleep in cloudy, foggy Weather, and ſome Creatures ſleep all the Winter, till the Heat raiſe Steam in them to thin their Blood, &c. We ought alſo to conſider all the Contraries which prevent Sleepineſs, as eating and drinking ſparingly, a clear Stomach,

Animal Proceſs.

Stomach, and a briſk Ferment, a moderate Quantity of ſpirituous Liquor, moderate Action, or any other Cauſe which moves or excites a ſufficient Steam from the Stomach or Guts to circulate the Blood, or which ſhuts the Pores when they are too much opened by Heat without, or Action, ſo that the Steam perſpires as faſt as it riſes, and prevents its farther Waſte, and keeps in the ſucceeding Steam, to reſtore our Strength and Vigour, as cool Air, a ſtrong Preſſure of the Atmoſphere, &c. Whether the Air has the ſame Effects upon the Pores, or Bladders in the Lungs, as it has upon thoſe in the outward Skin, whether cool Air condenſe the Steam there, and ſtraighten the Pores, or whether it bear off more Steam than hot Air does, I am not certain. One cannot ſleep, or Sleep does one little good unleſs one be kept moderately warm, and unleſs there be ſomething in the Stomach or Guts lately digeſted, to prevent any Uneaſineſs by the Cold without, or by the gnawing of the Juices within. When the Steam goes off too ſharp, or too little entangled, or with too ſmall Burthens, and frets or heats the Parts too much, or when too much of it goes and hurries the Blood too faſt, it

What hinders that Inclination.

What abſolutely prevents Sleep.

puts one into a Fever, and hinders one from ſleeping; and when one ſleeps, either the Fever abates by Sleep, or the Fever is begun to abate before one ſleeps; ſo it ſeems that too little Steam, or groſs inactive Steam, cauſes Sleep; and too much or too ſtrong, or too active Steam hinders us from ſleeping. When one ſleeps, the Juices have Time to ſecrete into the Stomach, the Agents have more Time to act, or repeat their Actions, in the Stomach and Guts, becauſe there is no Action to force off the Steam, and a little ſerves to circulate the Blood, becauſe it moves very ſlowly, becauſe the Lungs move, and reſpire very ſlowly, and becauſe the little Steam, which perſpires at the Pores by being defended from the Motion of the Air, is not condenſed, or diſperſed, but rebounds and keeps the Body warm, and the Fluids thin; and 'tis very likely, that in the regular ſlow Motion of the Blood during Sleep, the Corpuſcles adhere, to ſupply thoſe born away from the Parts in Action, and that ſeveral Secretions may be made to ſupply the Veſſels, and eſpecially the Nerves, with each their proper Juices, Steam, &c. for the ſeveral Uſes to which they are employed. When every Thing is in freſh Motion, the Stomach warm and light, the Parts replenishhed with Steam and plump, the Blood thinned, and in Motion, the Nerves ſtock'd with Steam, and the Body fit for Action, we awake. The Steam augments gradually, from the Time we begin to ſleep, till it come to a due Height, when we naturally awake; and if we lie much longer in the common Degree of Cover without Motion, the Heat encreaſes, the Steams are rarified too much, or the Pores opened too much, or both; and though the Blood do not circulate very faſt nor ſtrongly, abundance of the Steam perſpires, as one may plainly ſee, by holding one's Hand out between one's Eyes and the Light; and if one lie long, one will be as lank and as faint as when one firſt laid down: and lying down, will never recover one, till one have freſh Supplies of Food to raiſe Steam, or till one riſe, or uſe Action; I think when the Steam is weak, and one falls aſleep, at firſt when one begins to ſleep, the Steam for ſome Time is weaker than when one was awake: For if one fall aſleep in a Chair, and ſleep for half an Hour, one's Face and upper Parts will be much paler, than if one had ſat ſtill as long in the ſame Poſture awake. And as the Steam

The natural Time of waking.

The Inconvenience of lying after that Time.

The Steam weaker when one falls aſleep than when awake.

The Conſequence of it.

is weak at Night, when one goes to ſleep, 'tis no wonder that a great Quantity of Meat, or Meat hard to digeſt, lies heavy upon the Stomach for ſome time, and does not digeſt, and go off, till the Steam by ſleeping, riſe to a ſufficient Force. If one riſe in the Morning when Sleep has done its Office, and the Stomach be contracted, any ſort of ſolid Meat will be acceptable to the Stomach. If one lie too long, till too much of the Fluids be born off in Steam, and the Steam be too much weakened, or the Stomach be diſtended, thin warm Meat will be more agreeable. Beſides the Advantages aforeſaid, there is ſome conſiderable Difference between being aſleep, and reſting awake; whether when one is awake, the Steam be not refined, and thinned ſo much, or the lacteal Veſſels are not expanded, and relaxed ſo much, or the outward Pores are not ſo open, or there is a greater Quantity of Juices, or Juices more groſs, iſſued into the Stomach and Guts. If one ſit, or reſt long, the Stomach and Guts fill and extend with groſs Steam; which, if the Excrements, at the ſeveral Valves, be not too thin when one begins to uſe Action, will be diſcharged backward. If it cannot be ſo diſcharged, Action will rarify

The Morning Appetite different by protracting Sleep.

The Advantages of Sleep.

rarify or force it off. But one ſeldom find's one's Stomach or Guts diſtended out of courſe, when one has ſlept ſufficiently. 'Tis ſaid, the Eaſtern People uſe the beſt Opium, and that it makes them briſk, ſtrong, and fierce, and that which we uſe, is but the coarſer Part, and Droſs of the Opium, and ſo makes us ſleep; but that cannot be always true. Suppoſe the Effect of Opium to open the Glands in the Stomach, does the fine Opium let in finer Juices, or more leiſurely, and the coarſe Opium the coarſer Juices, or too faſt, and raiſe too groſs a Steam? Or do we err in Quantity, or does it let in too many Juices into the Stomachs of thoſe who uſe it ſeldom, raiſe too groſs a Steam, and confound their Senſes, till Sleep has thinned and carried it off? Or does it open the Glands in the Brain, which ſecretes the Steam for the Nerves; the finer a little, and the coarſer too much, and work its Effects there. Although 'tis likely, it will have like Effects upon the Glands, wherever it paſſes, it ſeems to me, that it has its principal Effect in the * Stomach, becauſe it makes many People vomit conſiderably in a very ſhort Time.

Concerning Opium.

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* Dr. *Mead* in his Treatiſe upon Poiſon, relates an Experiment upon a Dog, where what Effect it has in too large

CHAP. XVI.

The Effects of too much Cold.

1ſt. It condenſes the Steam and repells it.

WHEN for want of Action, or Strength of the Steam within, the Cold prevails too much upon the outward Parts, it condenſes the Steam there, and thickens the Blood, ſhuts the Pores, and contracts the ſmall Veſſels, and thereby the Blood is obſtructed, ſo that it cannot paſs in due Proportion, for Circulation and Secretion. And in Proportion to the Quantity and Degree, 'tis ſo coagulated, it becomes more or leſs difficult

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large a Doſe upon the Stomach, is exactly deſcribed, and which, according to Mr. *Hutchinſon*'s Theory, very eaſily explains the Operation of this Drug, whether uſed as a Medicine, or given in Quantity ſufficient to prove deleterious, and become a Poiſon. I beg Leave here to deſire the Reader to peruſe this Chapter of the Doctor's accurately, and then impartially to decide whether his Account of Sleep, or Mr *Hutchinſon*'s ſeems more rational, and which more becoming a Treatiſe, whoſe Title imports a Mechanical Account of the Things it treats of. Vid. *Edinb.* Med. Eſſays, Vol. 5. Dr. *Alſton*'s Eſſay on Opium, and his Exp. on Frogs and other Animals therewith: There you will ſee how this Drug operates plainly, viz. by its Effects upon the Steam; the Motion of the Blood is render'd ſlower and ſlower till the Animal dies. The Dr. has ſome very odd Expreſſions as to the Variation of the Pulſe, but this concerns not us, we want only his Experiment.

cult for the Steam to thin it, as it returns into the larger Veſſels within. But as the Steam is hindered from perſpiring, it encreaſes its Force within, and makes a greater Effort to circulate and throw off the coagulated Blood. At firſt it cauſes Stoppages, or Obſtructions in the Head, Lungs, &c. and paſſes with great Difficulty through the Veſſels, in the Parts which have been bruiſed, ſtrained, or broken, and cauſes Pain there. If the Steam be able to thin Part, and throw off the reſt at the Noſe, by coughing at the Lungs, by Sweat, turbid Urine, or into the Guts, and thence by Looſeneſs, little Damage enſues: If not, the Effort is continually heightened, till it terminate in a Rheumatiſm, or Inflammation upon ſome Part, or in a Fever. The Pores of the Feet being much opened by Heat in walking, the Steam iſſuing, rarifies the Air between the Soles of the Shoes and the Feet, and Water paſſes in form of Steam through the Soles, and mixed with Heat, enters the open Pores, and circulates in the Blood, coagulates its Corpuſcles, cauſes Stops in the ſtraight Veſſels, in the Head, &c. as aforeſaid. And Wet thus conveyed to any Part of the Body, as by damp Sheets, &c. enters more, and

The Effects from theſe.

Cold from Wet by the Feet.

does more Hurt than if the Part were kept immerſed in cold Water. When the Corpuſcles of Blood, or Juices are ſtorkened, or united, or made craſſer by Cold in any Part, Wet on the Feet, &c. thoſe Maſſes, as they are circulated, ſtop in the ſtraighteſt Paſſages, aud cauſe Obſtructions there, and the Juices ſo coagulated, and theſe they ſtop in the ſtraight Paſſages, are wanted in the Places whither theſe Paſſages lead. For if A and B unite together, they cannot paſs where either of them would have paſſed alone, nor ſupply their different Offices where they can paſs. Suffering the Belly to cool too much, makes the Steam there condenſe, and the Juices preſs in, and cauſe the Colic, or affect the Guts, according to their Qualities, cauſe Looſeneſs, &c. and perhaps, condenſing the Steam too much by Cold in any Part of the Body, makes ſome Secretions of Juices into that Part, which may contribute towards cauſing Pains and Rheumatiſms, as well as the Stagnation of the Juices. And Cold may have the ſame Effects upon the Steam in the Nerves, though that be not ſo eaſily perceived. When any of the inward Glands are ſtraightned by Swellings, Stoppages, &c. they ſecrete ſharper Juices than uſual, and

The general Effects of Cold.

Inconvenience of the Belly being too cold.

and have different Effects upon the different Parts: Theſe ſecreted into the Lungs and Throat, tickle the Parts, cauſe Coughing, &c. How theſe Efforts in the Lungs we call Coughing, are performed, whether by Phlegm, or ſomething which ſwells the Glands, ſtopping the Steam till it break out with greater Force, or whether when any ſuch ſharp Juices tickle or offend the Lungs, or Neck of the Wind-pipe, it occaſions thoſe Convulſions, and how that can be involuntarily performed by the Aſſiſtance of the Muſcles, or whether the Neck of the Wind-pipe be ſo contrived, that when any Thing offends, it ſhut without Direction of the Will, as our Eye-lids do, and the Force of the Steam and Air breaks out in Jirks, deſerves to be conſidered. And perhaps, the Cold in the Northern Countries may ſhut the Pores of the outward Skin, or ſtraighten them ſo much, till they retain the Salts and ſharp Juices in the Veſſels and Glands, which ſhould be perſpired there, and cauſe the Itch. When there is any thing in the Blood, to be thinned or driven off, the Steam ſhould not be abated too much. When the Steam within is almoſt wholly condenſed with Cold, warm Fluids or Spirits which will paſs the

A Conjecture about the Itch.

What required upon the firſt Effects of Cold.

the *Pilorus*, if it be open, or riſe ſooneſt into Steam and paſs, refreſhes one ſooneſt. Or if Cold have condenſed the Steam, and let in the Juices, warm Fluids which will paſs ſooneſt into the Guts, and dilute or ſoften the Juices, give Eaſe ſooneſt.

Agues the Effects of cool, moiſt Air.

When the Air is charged with cold, humid Matter, it bears not off enough of that ſort of Matter from the Lungs; and perhaps, alſo leaves ſome of the Matter it carries there, and condenſes and clogs the Steam, and if it be diſcharged among the Juices into the Stomach, may cauſe Agues, &c. and when it has cooled and contracted the Stomach too much, the brinous Juices (which I ſuppoſe come laſt) will diſcharge in too great Quantity into the Stomach, raiſe the cold Matter there into Steam, and cauſe hot Fits, and the different Degrees of Heat and Cold between Day and Night, may make them periodical.

Conjecture upon their being periodical.

CHAP. XVII.

The Effects of too much Heat.

1ſt, Rarefaction of the Blood, and Expanſion of the Veſſels.

OUtward Heat thins and expands the Blood and Juices, in the Veſſels and Pores; and expands and opens the

Veſſels and Pores, and gives free Paſſage for the Steams outward. Outward Cold condenſes the Steam, thickens the Blood and Juices, in the Veſſels and Pores, contracts the Veſſels, ſhuts the Pores, and hinders the Paſſages of the Steam outward. And the greateſt Danger ſeems to be when the Seaſons change very ſuddenly; when the Steam is heightened, before the Paſſages and Pores be opened, the Blood thinned, and prepared by Degrees; or when the Seaſon becomes ſuddenly cold, whilſt the Paſſages and Pores are open, the Blood thin, and the Steam high. When any one removes ſuddenly into a hotter Climate, and where the Preſſure of the Air is greater, it lets go the fineſt Juices at the Pores, and preſſes too great a Quantity of the ſharp Juices into the Stomach and Guts, and cauſes Fevers or Fluxes. When the Air is charged with too much Heat, volatile Salts, &c. it will not take away a due Proportion of ſuch Matter from the Lungs, and perhaps leaves ſome there, which being ſecreted with the Juices into the Stomach, cauſe hot Fevers, &c. And when the Salts are extremely ſharpened by Fermentation, infectious Diſeaſes, &c. Air charged with the contrary ſorts of Matter,

Danger of ſudden Heat.

Or Cold.

Change of Climate.

Too hot Air the Occaſion of contagious Diſorders.

The Remedies propoſed.

ter, or pure, or in Motion by Wind, if the Diſorder be not gone too far, prevent, however abate it. And 'tis likely Food not too fluid or thin, which has had the Spirits and Salts extracted out of it, might ſtop a Fever, by clogging the Juices, and diſcharging them downward. I have ſeen about a Quart of Man's Excrements, which had been ſome Days diſcharged, thinned with as much Ale, poured into a Horſe ſtark mad, in that violent Diſtemper they call the Staggers, of which they commonly die in a few Hours, and the Diſtemper abated, and the Horſe recovered; whether the Cauſe proceeded from too violent a Ferment in the Stomach, which that abated, deſerves to be conſidered,

A common Experiment and Conjecture upon it.

CHAP. XIX.

The Effects the Matter in the Air, and the different Gravity of the Air, have upon Animals during the Time that Rain riſes.

The Condition of the Body while the Rain is riſing.

WHEN Rain is riſing, the Preſſure of the Atmoſphere is leſſened, and Abundance of Corpuſcles of Heat, and

Moiſture, &c. are mixed in the Air, the Courſe of Things in our Bodies are varied. All the outward Parts being leſs compreſſed, and the inward Force exceeding that without, the Stomach, is ſuffered to extend, by the Force of the Steam, and the Guts to receive, and contain a greater Quantity of Excrements, moſt of the Blood will be in the outward Parts, and not be preſſed back or inward, ſo much as 'tis forced outward, and all the Veſſels and Glands in the outward Parts will extend, and contain a greater Quantity of Juices, as lacing Stays very hard, or compreſſing the veſſels in any conſiderable Parts, will contract or flatten the Veſſels in thoſe Parts, make the Blood and Juices fly into the other Parts, and make the Veſſels extended, and the Parts plump. And the air cannot condenſe nor bear off the like Quantity of Heat, and Moiſture at the Lungs, as it did when cool and pure; for whatever the Air is ſaturated with, as Corpuſcles of Heat, Moiſture, &c. they fill up the Interſtices of the Air, which admit theſe ſort of Corpuſcles, and leave no room to admit and bear off Corpuſcles of the ſame Sort from the Lungs, and perhaps rather leave ſome of thoſe it carried there. And if any ſort of Matter be not diſcharged in ſufficient Quantity,

The Alteration of the Air then and its Effects.

Quantity, it muſt abound too much in the Blood, and affect the Body according to its Quantity and Quality, and in this Caſe, the Matter not diſcharged and remaining extends the outward Parts farther, the lower Parts moſt, makes the Feet ſweat, &c. and expands the Blood and Juices, and only the finer thinner Matter goes off at the Pores, and not proper Matter, nor in due Quantity. When all the Veſſels in the outward Parts are extended they will one compreſs another, and the Body will be heavy and dull, and if there be any Parts that have been broken or bruiſed, or that are weaker than the reſt, they will be extended, and compreſſed, more than the reſt, and cauſe Pain, and the Veſſels and Glands thus extended for any conſiderable Time loſe their contractive Force, which was performed by preſſing the Juices into the ſmaller Veſſels in the Sides of them. And the Compreſſure of the Air being alſo leſſened, the Blood makes not Secretions of Juices neceſſary for the ſeveral Uſes: They will not be preſſed in due Quantity into the Stomach, and the Meat will not be duly digeſted, nor into the Guts to diſcharge the Excrements downward, and when a Stop happens there, by this or any other Cauſe, the Meat is kept too long fermenting upon the Stomach, and in the Guts, till it be divided ſo ſmall that the greateſt Part is forced through the lacteal Veſſels into the Blood, and the Salts, &c. freed too much, and made too ſharp for the Juices, and the Remainder, which ſettles downward, is only tough Phlegm, which it could not diſſolve, nor the Guts ſcarce diſcharge. If this Caſe continue not too long, ſo that the Body endure it without farther Inconveniency, when the Rain falls and clears the Air, and the due Preſſure and Coolneſs of the Air returns, the Coolneſs and Pureneſs of the Air condenſes, and diſcharges a due Share of the Steam out of the Lungs, ſtorkens the Juices in the outward Pores, and jointly with the Increaſe of the Preſſure ſhuts the Pores, repels the Steam, and encreaſes its Force inward, makes the Glands diſcharge into the Stomach and Guts, digeſt the Meat, and diſcharge the Excrements, and Things take their former Courſe. If there were a great Quantity of ſharp Humours preſſed out of the Blood, into the Stomach and Guts, or freed by Fermentation there, before the Rain begins to riſe, when it begins to riſe, and the Preſſure of the Air is leſſened, they will be driven out in great Quantity by Steam into the

What happens upon the change of this Weather.

Blood, and make the Body hot and uneaſy, and upon the Return of the due Preſſure of the Air, will be preſſed ſuddenly into the Stomach and Guts, make a Hurry, or cauſe Diſorders there, according to their Quantity, Quality, or other Circumſtances. And generally a while after a healthy Perſon riſes out of Bed, and comes under a greater Preſſure of the Air, the Juices will be preſſed inward, and he will have an Inclination or Motion too a Stool. Sick People are more ſenſibly affected by the different Preſſures of the Air, Degrees of Heat and Cold, &c. Nay even by riſing or going to Bed. Difference in Clothing, girding it cloſe about the Middle, or leaving it looſe, &c, according to the various Cauſes which affect them, and by the periodical Alterations of the Gravity of the Atmoſphere, by the Courſe of the Moon, &c. ſeveral Diſeaſes have more or leſs Effect; and ſeveral Secretions and Diſcharges are made regularly, except ſome other Circumſtances intervene, and the Degrees of Heat between Summer and Winter, Day, and Night, &c. each change and renew the Operations in our Bodies. * Experiments

Sick People ſenſible of the leaſt Alteration of Weather.

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* See *Hoffman* Medicin. Rational, Tom. I. p. 87. Sect. 4 & ſeq. Edit, 4to. 1729. Theſe ſhew that the Experiments made, anſwer the Effects here ſuppoſed.

riments ſhould be made, whether one be not much heavier when the Air preſſes leaſt, and the outward Parts admit more, and the Guts diſcharge leſs, than one is, when the Air is ſtrong, and the Diſcharges regular, and whether one is not ſtronger and weaker, in Proportion to the Strength, or Weakneſs, of the Preſſure of the Atmoſphere.

CHAP. XX.

The Effects, the Matter in a Wind which comes over a vaſt Tract of Land, has during the Time it blows.

A DRY, eaſterly Wind, brings along with it, from the Continent into this Iſland, Corpuſcles of Cold, and of ſome mineral or terreſtrial Matter, heavier, or leſs active, than thoſe which other Winds bring from the Sea, and they thicken the Juices in the outward Pores, and hinder the Steam and Matter it bears with it from perſpiring, and 'tis likely do much the ſame things in the Lungs. Whether it be by the ſudden Changes, or that the Corpuſcles it brings, be more inactive than thoſe of Cold, Of our Eaſt Wind.

they affect or diſpirit our Bodies, more than a great Degree of Cold does, when the Wind comes from another Quarter: Whether 'tis by hindering a due Diſcharge out of the Blood at the Pores and Lungs, or whether the Air, being ſaturated, is not able to admit and bear off what is diſcharged at the Lungs, or whether it inſinuate its Corpuſcles into the Blood at the Lungs, and leave them there, or all theſe Ways, I am not certain. But the Pulſe is diſordered, and 'tis likely the Juices are rendered thicker, or leſs able to ſecrete, or leſs active when ſecreted, and the Steam does not riſe in ſufficient Quantity, or is too groſs to paſs, or is obſtructed by the Thickneſs of the Blood and Juices; and being ſo pent up in the Guts, and inward Parts, extends them, cauſes a croaking Noiſe in the Guts, hinders due Digeſtion, and regular Diſcharges. And though the Phyſicians order their Patients to keep within Doors warm, when an Eaſt Wind blows, I think thoſe who can endure Exerciſe, need it more than at any other Time; and briſker Liquors then than they are accuſtomed to. In this Caſe, as in others, when the Blood is thickned too much, or when regular Diſcharges of the Steam and Excrements are not

Its Effects upon our Bodies.

not made, the Veſſels will extend, and cauſe Pain, where they have been ſtrained, bruiſed or broken, or where they are weakeſt, in Proportion to the Quantity of Matter in the Air, the Time it continues, &c. when any conſiderable Quantity of Rain falls, during the Time this Wind blows, it abates the Effects for ſome Time. If this Wind continue for any conſiderable Time, till it has thickned the Blood ſo much, that the Juices cannot paſs into the Veſſels in the Sides of the Guts, to ſhut the Valves freely, the Steam will paſs out of one Diviſion of the Guts into another, irregularly, both down and up, and encreaſes the ſaid croaking Noiſe in the Guts, and will hinder the ſeveral Parts from contracting in their Turns, and conſequently the Juices from iſſuing into the Sides of the Stomach and Guts, for Digeſtion, Diſcharge, &c.

CHAP. XXI.

The Cauſes of different Conſtitutions.

Difference of the Conſtitution depends upon the different Formation of the Organical Parts.

THE Word Conſtitution is very common in every one's Mouth, what they mean by it, is difficult to gueſs. I think the Difference of the Operations in different Bodies, muſt proceed from the different Sizes of the ſeveral Tubes and Glands, from the Strength or Thickneſs of their Sides or Valves, and the different Quantities of the Fleſh, and the Thickneſs of the Skin, or the Difference in Solidneſs or Laxneſs of the Fleſh, or Skin, which environs and covers them. 'Tis true, the Fluids are a great Part of the conſtituent Parts of the Body; but ſuppoſing two Bodies, whoſe Tubes or Valves differ in Capacity, in any one or more Parts, and whoſe Fleſh differ in Quantity, and Skin in Thickneſs or Degree of Solidneſs, fed with the ſame Diet, uſing the ſame Exerciſe, and every Thing exactly, the Fluids will differ, and contain more of this, or that ſort of Matter, &c. and conſequently the Operations differ. If the Ducts and Glands into the Stomach and Guts be wider, and ſecrete more of that ſort of Liquor, in one than another, the Operations there will be ſtronger, and there will remain leſs of that Matter in the Blood, ſo of Gall, or any other of the Juices. A Man that has a great Quantity of Fleſh, or is fat, cannot perſpire the Steam in ſuch Quantity at the Pores, but the greater Quantity will go at the Lungs, and in violent Exerciſe choak him. A Man that is lean, or has little Fleſh to cover the Arteries, Veins, &c. will be weak, becauſe the Steam will perſpire at the Pores too faſt. A Man whoſe Ducts or Glands for ſecreting the Juices, to open the Valves, and diſcharge the Excrements, are too ſtraight, will often be coſtive, and thoſe, who have them too open, will often be too looſe. The Conſtitution no doubt, is formed in the Womb, by the different Juices of the Parents, by the Food of the Mother, and various Accidents, and may be, in a great Meaſure, changed afterwards by various ſorts of Food, and by divers other Means. A Perſon that has been breed, or accuſtomed, to eat cold Fruits, and ſuch Things as give Opportunity to the Juices to iſſue plentifully into the Stomach, and afterwards eats and drinks hot Food, and ſtrong Liquor, will ſtraighten the Ducts and

Conſtitution form'd in the Womb, chang'd afterwards by various Accidents and Glands into his Stomach, and alter the Compoſition of his Blood. In Northern Countries, where the Corpuſcles of the Vegetables, as Oats, &c. are light and hot, where the Heat is not ſufficient to raiſe Fruit, whoſe Corpuſcles are cool and heavy, theſe People's Blood abounds with Corpuſcles which occaſions the Scurvy. Thoſe who feed on too cold Fruit, or Diet, will make too great a Diſcharge, or Waſte of the Juices into the Stomach, and occaſion ſomething like the Rot in Sheep, which feed upon the cold Graſs. A thouſand Inſtances might be produced whereby the Conſtitution is altered; and the Skill of the Phyſician conſiſts chiefly in knowing what Ducts or Glands let go or retain too much, or too large, or too ſmall Corpuſcles, and how to widen or ſtraighten, open or ſhut them. Weak, cold Food cauſes a great Supply of Juices to iſſue out of the Blood, into the Stomach, and requires Action to free more to ſupply the Blood. Liquor, and Food moderately ſtrong, need fewer Juices to raiſe them into Steam, and ſuffer fewer Juices to iſſue out of the Blood: And if there be equal Action, conſequently the Blood will be ſtocked with a greater Quantity of thoſe Juices; and Errors may be committed either Way. If the Juices intended for Diſſolution of the Food, for Diſcharges, &c. be hindered from iſſuing into the Stomach by Aſtringents, ſuch as red Wine, &c. they may affect the Parts, make the Blood too ſharp, &c. If from iſſuing into the lower Guts or *Rectum*, they may make the Veſſels ſwell, and cauſe the Piles: And any Part may be affected by Salts, or any other Thing, not from the Abundance of that ſort in the Food, but from the Ducts, or Veſſels which retain too much of them, or deprived of their Uſes, by letting them go too faſt. And the ſame Doſe, of any ſort of Phyſick, has different Effects upon Bodies, which have the Glands into their Stomachs or Guts of different Wideneſs, or which have different Qualities of this or that Matter, or of Matter of different Sorts in their Stomachs or Guts, or in the Glands or Blood-veſſels, ready to be ſecreted into them, when irritated by the Phyſick, nay even upon the ſame Body, as thoſe Circumſtances vary.

In order to deſcribe how Vomits, Purges, Clyſters, Diuretics, &c. perform their ſeveral Operations, we muſt ſtate the ſeveral Sorts, and Quantities of Matter there may be in the Stomach, Guts, Glands,

Glands. &c. the ſeveral Steps they make in their Operations, the ſeveral Degrees of their Operations, the ſeveral Poſitions they leave Matters in after their Operations, the ſeveral Effects the Matter diſcharged had, and the Matter remaining may have upon the Body.

CHAP. XXII.

The Uſe of Vomits, how they operate; the Damage they may do in ſome Caſes.

The Intention of taking a Vomit.

THE Intention of taking a Vomit, is to diſcharge Phlegm lodged at the Bottom of the Stomach, on the Sides, or in the Glands, or brinous, or bitter, or ſour Juices from the Bottom of the Stomach, or out of the Glands, or out of the Blood through the Glands, when there is too great a Quantity, or when they are unfit for their Uſes. The proper Time of taking it, is when the Stomach has ceaſed fermenting, diſcharged what it can, contracted, and the Glands in the Sides are filled, and the *Pilorus* ſhut, and the Ferment in the Guts is pretty ſtrong.

The Time of taking.

Of what Nature an Emetic ſhould be.

There ſhould be ſuch Corpuſcles in a Vomit, as will open the Glands of the Stomach, till Juices ſecrete and raiſe a Steam, and ſuch light ſharp Corpuſcles, as that Steam can bear up, and with them, open the Glands in the Valves of the upper Neck of the Stomach, make them ſecrete, and thereby weaken, and open till the Steam get Vent, and open all the Neck upwards, and the Glands in the Valves of the Throat, and in the Mouth; ſo that upon drinking a Quantity of thin lukewarm Fluid, the Preſſure of the Air againſt the Belly below, and of the Steam in the Guts, and into, and through the Blood-veſſels, &c. in the Sides of the Stomach, and the Elaſticity, or Expanſion of the Steam in the Stomach, and Contraction of the Muſcles of the Belly force the Steam, the ſour Juices, Oil, and tough Phlegm, which ſwims upon the Liquor, and the Liquor after it, out upwards, and ſo ſucceſſively, as more Liquor is taken, more Juices or Phlegm ſecreted, or raiſed to the Top of the Fluid diſcharge them ſtill thinner and thinner, till moſt of the Phlegm be diſcharged; and after that, if there be any ſolid Pieces of undigeſted Meat at the Bottom of the Stomach, diſcharge them with the Fluid, and caſt off all bilious, bitter Juices in the Liquor, which, when once they begin to be ſtirred or ſecreted, ferment and fly like Gunpowder, and open the other

Glands, during which it offends the Stomach, makes one deſperate ſick; but they force their Way, and are diſcharged in a ſhort Time, and the Operation of the Vomit ceaſes. I cannot ſee how a few Grains of Matter put into the Stomach can perform this, and ſuch like Operations any another Way, but by opening the Glands, and letting in Juices. When there is a great Quantity of tough Phlegm in the Bottom of the Stomach, upon the Sides, or in the Glands, it entangles and blunts the Corpuſcles in the Vomit, hinders them from opening the Mouths of the Glands, or when they are opened, tough Phlegm is difficult to force out of the Glands. Some think the Morning the moſt proper Time to take a Vomit, perhaps there may be leſs, or thinner Phlegm in the Stomach, and more Bile in the Glands. Beſides in the Morning the Blood is thin, and the Juices in it more capable of being ſecreted, and the Steam is thin, briſk, and more capable of ſecreting them. If one take a Vomit, when there is a Ferment in the Stomach, and it is extended, and the *Pilorus* open, the expanded Force of the Steam within, reſiſts or hinders, the Valves of the Glands in the Stomach or Neck of it, from opening,

Reaſons for taking a Vomit in the Morning.

ing, and ſecreting: And ſo the Gland in the upper Neck of the Stomach, continue expanded with Juice, and ſtrong, and reſiſt the Force of the Steam from iſſuing upward. Warm Liquor does not condenſe the Steam, and if you drink cold Liquor, it will quite condenſe the Steam, hinder the light Corpuſcles from being born up, to open the Neck of the Stomach, and will ſtop the Operation, or make it work downward. If you open the Valves at the Neck, with a Feather, the Matter, Liquor, and Steam will break out with incredible Force. But as long as the *Pilorus* is open, the Guts will ſupply the Stomach with more Steam, and keep it diſtended, and unleſs the Steam break upward in ſuch Quantity, or be abated, ſo that the Steam in the Blood can preſs the Blood and the Juices into the Veſſels in the Sides of the Stomach, and contract it, and ſhut the *Pilorus*, the Valves of the Glands cannot open, nor ſecrete, nor the Stomach diſcharge any Quantity of the bilious, or ſharp Juices, and the Diſcharge will be in Proportion to the Contraction. When the Stomach and Glands are cleanſed, and naked, as ſoon as they are repleniſhed with Juices, they would ſecrete greater Quantities. But perhaps, in

The Uſe of warm Liquor in the Operation, and Effect of Cold, and Uſe of a Feather.

The Diſcharge differs in Quantity, and why.

in diſcharging the Juices out of the Blood into the Stomach, ſome Steam paſſes, and when a ſufficient Quantity of Juices is ſecreted into the Stomach, they raiſe a Ferment, and ſtop the Valves of the Glands, and leſs Quantity of them is needed to raiſe the Steam, and diſſolve the Meat, than when there was a great Quantity of Phlegm in the Stomach, too tough to be divided by them, or ſmall enough to be born off by the Steam. And they will digeſt the Meat ſooner and better, and the next Vomit or Purge will come at, and open the Glands ſooner, and work more effectually. If any Vomit could be prepared to work effectually when the Stomach has been lately filled with cold, heavy Meat and Drink, even too full, and the Juices ſecreted into it before the Ferment were raiſed in any conſiderable Degree, I think there would be a greater Diſcharge of the Phlegm, Juices, &c. than at any other Time. The Phlegm diſcharged from one's Stomach will diſſolve in ſimple Water, perhaps aſſiſted with the Juices that come along with it. If one drink a good Quantity of Vinegar, or Lime-juice, would it diſſolve the Phlegm in one's Stomach, or would it raiſe an Explosion or Ferment, and carry it down? If it did either, what Effects

A Conjecture upon vomiting with a full Stomach.

Qu. As to Acids as preparatory to Ementicks.

Effects would it have? If it did not carry it down, would a Vomit work ſoon after? A Stop in any Part of the upper Guts, makes the Steam reverberate into the Stomach, and upwards to the Top, and cauſe vomiting, or what we call an Inclination to vomit. When there is ſome light ſour Matter upon the Stomach, which flies up, and opens the Glands in the Neck of it, that always makes us ſubject to belch. Some ſorts of ſtale Beer raiſe a Steam, which makes the Glands in the Neck of the Stomach open, and Juices ſecrete, and makes ſome liable to belch, ſome to have that Pain in the Stomach which they call the Heart-burn, and perhaps different Things affect different Perſons. When one rides hard with a full Stomach, ſoon after eating and drinking cold Drink, the Motion jirks the Fluids, and the ſecreted Juices, which perhaps ſwim at the Top, to the Neck of the Stomach, and open the Valves, and the Contraction of the Stomach, &c. makes one puke up the Fluid cold: for whilſt the Fluid is cold, and the Steam condenſed, one cannot rift, or belch what we call Wind. And when one has been looſe, and the Glands in the Stomach open for ſeveral Days, the Juices, ſome Time after eating, do not make the Fluid ſo bitter, and ſharp when puked, as they do at other Times, when one has been bound. It was ſuppoſed that the late Duke of *Leeds*, by eating much cold Fruit, or drinking much cold Liquor when hot, contracted his Stomach ſo, that it threw out any Food, or Drink, almoſt as ſoon as he had taken it. Perhaps the Glands all over, or thoſe in the Neck of his Stomach, were vaſtly extended and weakened, or perhaps ſome of them burſt, ſo that when he took any thing that raiſed Steam, and bore up any Corpuſcles, which opened the Gland, the Juices in the Valves diſcharged too much, and that opened the Paſſage and the Steam, &c. threw out the Contents, which it ſeems the Steam which roſe from a little cool Water, did not. If there were no Steam above the Food to expand the Stomach, it would contract, and preſs the Liquor both againſt the Valves of the *Pilorus*, and upward continually to the Valves in the Throat, and the Juices ſwimming would open them, and make us always liable to belch and vomit; and if the Guts were not ſo expanded with Steam, they would contract, and preſs the Liquor upon the Valves downward and upward.

The Caſe of the Duke of Leeds.

The Uſe of the Steam above the Food in the Stomach.

CHAP.

CHAP. XXIII.

The Uſe of Purges, how they operate, &c.

THE Intention of taking a Purge, is to diſcharge the Excrements and Phlegm out of the Guts, Stomach, or their Glands; and the ſharp, ſour, or bilious Matter out of any, or all of them, or which can be ſecreted through the Glands, out of the Blood into the Stomach or Guts, or when there is too great a Quantity of theſe Humours in the Blood, or diſcharged into the Stomach and Guts, or when they fall upon a Part, or when they do not diſcharge, or when the Juices perform not their ſeveral Offices. The proper Time of taking it, is when the Stomach has ceaſed fermenting, diſcharged all it can, the Glands filled, and the Stomach contracted, and the Steam in the Guts is moſtly ſpent. The Corpuſcles in a Purge ſhould open the Glands in the lower Parts of the Stomach, and open the *Pilorus*; but ſhould not be light enough, or liable to be born up by the Steam to the Neck of the Stomach. After the Corpuſcles in the Purge and Juices get Vent downward, they ſtill open the

The Intention of taking a Purge.

The proper Time.

Of what Nature a purging Medicine ſhould be, and its Operation.

Mouths of other Glands in the Guts, &c. after the ſame Manner as the Juices, &c. which diſcharge the Excrements, deſcribed above, but more forcibly. And when the Valves are opened, the Guts widened, &c. the ſame Agents, viz. the Preſſure of the Atmoſphere without, and Force of the Steam within, raiſed in the Stomach and Guts, and the Juices and Steam iſſued out of their Glands into them, diſcharge the Contents from one Part to another, as deſcribed above, &c. at laſt force out the Excrements, till the Steam diſcharged with them, weaken the Force of that which remains within; and then the Steam in the Blood quickens its Motion into the Veſſels of the Guts and Valves, and into the Glands of the Guts and Valves at the Fundament, Top of the Colon, &c. which contracts the Guts, and ſhuts the Valves, and ſo ſucceſſively; as the Steam and Juices are ſecreted, and more Steam raiſed, the Valves are opened, and Excrements diſcharged till the Corpuſcles of the Purge be intangled or diſcharged. A ſmall Quantity of thin warm Fluid is neceſſary to be taken in the Intervals for the Corpuſcles of the Purge to act in, and for the Juices to raiſe into Steam. The groſs Excrements go firſt, then

Warm Liquors neceſſary.

then the thinner out of the upper Guts, with a Mixture of the Fluid drunk in the Intervals, and if it work effectually, next the ſharp bilious Juices, which were in the Stomach or Guts, or ſecreted out of their Glands, mixed with the Liquor and Phlegm, ſometimes the Phlegm firſt, and the Juices laſt. The Phlegm will ſometimes make Stops, and the ſharp Juices always fret the Guts, make one ſick, and the Fundament ſore. If the Purge be not ſtrong enough, or work not effectually, either the Phlegm or Bile, or both, will ſtay, part in the Stomach, and part in the Guts, and the Phlegm will occaſion Stoppages, &c. and the Bile, if it go not down by Looſeneſs, cauſe colical Pains, Piles, &c. and if it go into the Blood, occaſion Fevers, Rheumatiſms, or &c. in Proportion to its Quantity and Quality. If the Corpuſcles of the Purge, or too many ſharp Juices wound the Guts, it cauſes that Pain we call Griping, and it is likely the Colic is often occaſioned by the latter. In a Purge, where Fluids can paſs quickly to them, they dilate or divide the Corpuſcles of the Purge, or Juices, to greater Diſtances, weaken their Force, and remove the Offence. But in the Colic, when the Valves are ſhut above,

Inconveniencies in purging whence.

above, or a Stop made, or the Parts filled, and no Diſcharge downward, the Fluids cannot preſently come at the Part offended. If there be a great Quantity of tough Phlegm in the Stomach, it intangles the Corpuſcles of the Purge, and prevents them from coming at the Glands, and hinders its Operation. If the Stomach be extended with a Ferment or Steam, or if there be little Phlegm, and a great Quantity of bilious Matter in the Glands, as ſoon as it begins to ſecrete, it flies, and makes a violent Ferment, and if the Steam be too ſtrong, it will bear up the Corpuſcles of the Purge to the Neck of the Stomach, and make one belch, and ſometimes vomit, and ſtretch the Stomach and Guts, and ſhut the Valves before the Glands have Time to ſecrete, and the Valves of the Guts open: And by ſhutting the Mouths of the Glands, and extending the Stomach and Guts, whilſt the ſmall Veſſels are full, compreſs the Nerves, cauſe Pain and Stitches, and drives Steam, compoſed of the Corpuſcles of the Purge, Juices, &c. into the Blood, till it force its Way downward. If theſe Valves were not very ſtrong, or if the Juices were forced into them, by a leſs Force than the Preſſure of the Air, the Air without would preſs the Steam and Fluids within, out, both upward and downward, the Excrements rather downward, becauſe of their Gravity, and becauſe the Guts are wider that Way, and when the Glands in the Valves have ſecreted, leſſened, and weakened the Valves, and ſuffered the Steam to make a Diſcharge. If upon the Abatement of the Force within, the outward Air and Steam in the Blood, did not in a Moment drive the Blood and Juices, into the Veſſels and Glands, that compoſe the Valves, and by extending them ſhut the Valves, all the Excrements would be diſcharged at once; and if the remaining Steam within the Guts, did not in a Moment reſiſt the Blood and Juices, they would extend the ſmall Veſſels in the Sides of the Guts to ſuch a Degree, as would almoſt cloſe the Guts. If the Juices did not ſecrete out of the Glands, and open the Valves, the Preſſure of the Muſcles of the Belly, or extending the Lungs, and preſſing down the Stomach and Guts, or contracting the Muſcles of the Stomach and Guts, (if they have any) would not further but hinder a Diſcharge. If the Excrements, Phlegm and Juices be effectually diſcharged, there will be little Supply of

Steam raiſed, and the outward Parts will be lank, for want of Supply of Steam to diſtend them; and the Preſſure of the Air compreſſes the ſmaller Veſſels, and forces a great Quantity of foul Matter lodged there by the Foulneſs of the Blood partly forced out of the Stomach and Guts by the Purge, and partly diſcharged out of the Glands, in the Blood-veſſels, by the Corpuſcles of the Purge, Bile, &c, born thither by the Steam to ſecrete into the larger Blood-veſſels; and the Tenſion of the Steam in the Guts being weakned, allows the Kidneys to ſecrete groſſer Fluids, and to diſcharge that foul Matter viſible in the Urine. The Excrement, and that which raiſed the Steam, being diſcharged out of the Stomach and Guts, and the Force of the Steam being thereby abated within them, it gives an Opportunity to the Steam in the Blood, preſſed by the outward Air, to force the Juices into the Veſſels and Glands, which compoſe the Stomach, and Guts, and Valves, and to contract, and ſtraighten them, and ſhut the Valves cloſe, and by the Preſſure of the Veſſels and Glands filled with the Juices, to ſtraighten the lacteal Veſſels. But a Day or two after the Purge, when the Steam is raiſed, and the Paſſages open, the Steam goes off freelier, makes the Blood move quicker, makes the Body light, and the Complexion florid, and after the Glands are repleniſhed with Juices and ſecrete, if they be ſharp, they make one rather feveriſh, and any Quantity of ſpirituous Liquor or Exerciſe does the ſame more, than when the Glands and Paſſages, were not ſo open. The Stoppages, Phlegm makes in the Paſſages, permit only the thin Fluids to paſs, and overſtock the Body with Salts, which are intended by Nature to diſſolve and carry off the Phlegm, and when we take away the Phlegm by Vomits or Purges, the remaining Salts do more harm to the Body, than they did when the Phlegm was in it, till they be clogged and carried off by Medicines, or Application, which keeps the Mouths of the Glands open long, and cauſe extraordinary Diſcharges, may do harm; becauſe the Glands firſt diſcharge thoſe Juices which are ſecreted into them, and afterwards as Ducts and Pipes, diſcharge other Juices promiſcuouſly without ſorting them. And if there be not ſufficient of every Sort left, neither Digeſtion, Evacuation, nor &c. can be performed for want of them, or for want of thoſe remaining, being ſharp, or bitter enough, &c. if there be abundance of noxious Matter in the Blood-veſſels, as in Fevers, Gouts, &c. when the inward Force of the Steam is abated by Purges, or any other Means, the Compreſſure without forces the Juices inward, and ſecretes them into the Stomach and Guts, and they are frequently mortal, if not ſoon allay'd by Abſorbents, or ſomething which ſheaths them, or expelled by ſomething which is aſtringent, raiſes briſk Steam, and forces them outward, as ſtrong red Wine, &c. And 'tis very likely, that much Miſchief is done in many Diſtempers, by allowing too weak, or too little Diet, and thereby ſuffering the malignant Matter to be driven inward, for want of Force to keep it outward, and diſcharge it that Way. It ought to be well conſidered, to what Degree of Height the Steam ſhould be kept by Drink or Diet in the Small-Pox, and all Diſtempers where it is neceſſary to expell the Matter outward, or from the Stomach, and even in Fevers, what Degree of outward Heat or Cover is neceſſary to open the Pores, and weaken the Force of the Steam within; what Degree of Cold, where any Thing ſhould be repelled, or whether artificial Cold in any

See above, p. 139

any Caſe ſhould be uſed. What they call ſtirring the Humours, by any opening Diet, or a Purge too weak to make any conſiderable Diſcharge, is only opening the Glands of the Stomach and Guts, and giving Paſſage for the Juices to ſecrete more plentifully into them, and whilſt that Matter continues in the Stomach or Guts, the Glands will ſtill ſecrete whilſt they have Supplies, or till the Agents be ſheathed, or till the Steam riſe and ſhut them. And too much of thoſe Juices will raiſe a Ferment there, according to their Qualities, too ſharp, ſour, bitter, or &c. perhaps convulſe the Parts of the Stomach or Guts, raiſe the Steam faſter than it can go off, extend the Guts, &c, or raiſe Steam ſo ſharp, or ſo hot, that it will hurry too faſt along the Arteries, wound them, or &c. And if the Matter taken be noxious, or if there be a great Quantity of noxious Juices iſſued out of the Blood, cauſe Fevers, &c. Perhaps 'tis no Advantage to the Body to humour the Palate conſtantly, for 'tis likely the Matter which gives a diſagreeable Taſte to the Palate, and makes the Glands diſcharge, does the ſame to the Stomach, and cauſes what we call an Effort of Nature, diſcharges the Excrements, cleanſes the

Effects of Openers.

the Paſſages, and prevents any great Quantity of malignant Matter, from lodging in the Blood, Stomach, or Guts. And 'tis likely that Vomits, Purges, &c. which have no Taſte, would, if applied to the Palate, as long as they are to the Coats of the Stomach, till their Corpuſcles were freed, make the Glands diſcharge, the Parts convulſe, &c. Things which are ſpirituous, or ſtrong in a Purge or Diet Drink, or during their Operation, or in any Effort of Nature, raiſe Steam, hinder the Glands from ſecreting, and force the Matter into the Blood; and after the Operation, whilſt the lacteal Veſſels are at Liberty to open, and the Stomach and Guts empty, ſtrong Drink, will ſend off Steam too faſt, Heat by Fire, or Cover, or violent Action does much the ſame. When any Juices ſecreted, or put into the Stomach and Guts, keep the Valves in the lower Parts of the Guts open or weak, the Excrements will fall downward, and the Steam will ſometimes get Vent, and break backwards. When the Excrement and Juices are fallen into the lower Guts, if one be confined, and do not go to Stool to diſcharge them, they will keep the Glands in the Guts open, let in more Juices, raiſe a hot Steam, and extend

Effects of ſpirituous Purges.

The Inconvenience of not going to Stool when Nature indicates.

extend the lower Guts very much, perhaps for an Hour, and afterwards, if you go to Stool, the Diſcharge will not be ſo free as it would have been at firſt. If the Exploſion be to any conſiderable Degree, or there be Abundance of Juices ſecreted into the lower Guts, among the thicker Excrements, the Ferment will continue, and perhaps the Belly will not ſettle of a whole Day, or till you have a large Diſcharge; becauſe the Juices entered into the thicker Excrements huff and ſplutter, and cannot ſuddenly diſcharge themſelves out; nor is it a ſmall Matter will make the Guts contract, and occaſion a Diſcharge, while there is ſuch an Exploſion. 'Tis likely the lacteal Veſſels are wideſt in the lower Guts, and that is the Reaſon why in Purges, and when thoſe Guts are empty, or extraordinary Ferments there, ſomething goes off into the Blood, which does not, when thoſe Guts are full of craſs Matter. How purging Waters operate, what Effects the Cold, the Water, and the Salt, have upon the Stomach and Guts, in what State they leave Things, vary according to the Quantity and Quality of the Water of the Humours in the Perſon who takes them, of the Seaſons, &c. and require a vaſt many Expe-

Of purging Mineral Waters.

Experiments, and a Volume to deſcribe them. 'Tis likely, the Waters when they go off, leave the Steam low, and the Stomach contracts, and lets in the Juices, which gives ſo ſtrong an Appetite. If theſe Juices come in too great Quantity, they ſometimes raiſe too great Ferments, &c. and frequently cauſe the Piles.

CHAP. XXIV.

The Uſe of Clyſters, how they operate, &c.

The Intention of a Clyſter.

THE Intention of taking a Clyſter, is to diſcharge the groſs Excrements, &c. out of the lower Parts of the Guts, which make Stops, or ferment too much, or ſtay till they are dry. When there wants Juices, in the Glands, to open the Valves, or when they do not ſecrete, to make regular Diſcharges of the Excrements, and when the Stomach is too foul, or in ſo great a Ferment, or ſo many malignant Juices in the Blood that one dare not diſturb it with a Purge.

What Nature a Clyſter.

There ſhould be Corpuſcles in the Clyſter, which will open the Mouths of the Glands in the Guts and Valves, and ſome thin Fluid for them to act in. Their Action and Effects, are much the ſame as thoſe of a Purge, as far as they reach. And as the lower Excrements are diſcharged, the upper ſettle downward into their Place, and that in the Stomach ſucceeds them, and has various Effects, according to the Quality and Quantity, as it hath in a Purge that works not effectually, only, it ſecretes not the Juices out of the Glands in the Stomach and upper Guts. It abates the Force of the Steam, partly by condenſing and clogging it, partly by diſcharging the Excrements, which raiſed Part of it, and by making a freer paſſage for the reſt. But gives an Opportunity to the Steam in the Blood, preſſed by the outward Air, to force the Blood and Juices into the Veſſels and Glands, which compoſe the lower Guts and Valves, and to contract, and ſtraighten the lower Guts, and ſhut the Valves cloſer, and by the Preſſure of the Veſſels and Glands to ſtraighten the lacteal Veſſels, and if it be too often repeated takes away the Juices which ſhould be ſeparated to open the Valves, and diſcharge the Excrements regularly. Injecting ſome cooling Juices, as they do a Clyſter, might perhaps abate the Steam, and do ſome Service in ſome Caſes.

The Effects of one.

CHAP.

CHAP. XXV.

The Uſe of Diureticks, the Manner how they operate, &c.

The Intention of taking them.

THE Intention of taking Diureticks is to diſcharge a greater Quantity of Fluids, Salts, or ſome other offenſive Matter out of the Stomach, Guts, Blood, &c. by Urine. The Time of taking them ſhould be when the Stomach hath diſcharged what it can, and the Ferment abated. They ſhould have ſome Corpuſcles in them, which will cleanſe, or open the Mouths of the Glands in the Paſſages, Ducts, and Valves of the Kidneys, Ureters, &c. give the Steam Power to diſcharge the Juices out of them, and thereby widen the Paſſages, weaken, and open the Valves of the Glands, in the Valves or Neck of the Bladder, weaken them and ſuffer it to be diſcharged by Urine. And it is very likely they open the Mouths of the Glands in the Stomach, Guts, lacteal and blood Veſſels, and ſuffer the Steam to ſecrete ſome Juices out of them; and theſe Juices will operate farther, according to their Quantity and Quality, and the Quantity and Quality, of the Matter

The Time

Their Nature.

Their Effect in the Stomach and Guts.

ter they carry along with them, out of the Stomach into the Guts; or in Steam, out of the Stomach and Guts into the Blood, and according to the leſſer or greater Force or Activity of thoſe Steams. When the Steam goes off loaded too much with Fluids, or Moiſture, it tires, falls by the Way, condenſes and goes off by Urine; when it goes off, with a greater Proportion of Fire, and volatile Salts, more of it perſpires at the Lungs and Pores, when loaded with Phlegm, it intangles in, and fouls the Veſſels and Blood. We make more Water in cool Weather than in hot; and when we drink cold or weak Liquors, than when we drink hot or ſtrong; and the Urine will be thinner and clearer, becauſe leſs of the thin Matter perſpires, and it will be leſs in Quantity, higher coloured, and thicker when more perſpires. I think the Corpuſcles of fixed Salts, cannot perſpire, without a ſtrong Steam, and great Heat, but generally paſs by Urine. If the Steam be weak, and the Guts contracted, and the lacteal veſſels preſſed, and ſtreightened by the Veſſels and Glands in the Sides of the Guts, extended with Blood and Juices, only the thinner Part of the Fluid, will go off with the Diureticks in Steam, and the Urine will be thin and clear. But if the

Diureticks go off, with a ſtrong Steam; when the guts are extended and the lacteal Veſſels opened, the Steam will carry off craſſer Matter into the Blood, and part of it will ſtick in the ſmall Paſſages and Glands, and Part be diſcharged with the Urine. If the Diureticks be in, or given in a great Quantity of Water, they will have various Effects according to the Contexture of the Blood and Juices in the Body. If there be a great Quantity of brinous Juices in the Glands, and the Diureticks open the Glands in the Stomach and Guts, and carry any conſiderable Quantity of the Juices ſecreted out of them into the Blood at once, and even diſcharge them that Way, they may do ſome Miſchief as they paſs; and if there be not too great a Quantity of them in the Blood, or ſtock in the Glands, &c. it will waſte them, diſable the Blood to ſupply the Glands, and the Glands to ſupply the Stomach, with ſufficient Quantity to diſſolve the Meat, and the Guts to diſcharge the Excrements. When there is a great Quantity of Fluids diſcharged, and the Quantity of Fluids in the Blood Veſſels, &c. abated, or the Steam weakened, and the diuretick Corpuſcles diſcharged or entangled, the Preſſure of the Air, forces the Juices into the ſmall

The Effects of Diureticks much diluted.

ſmall veſſels, and Glands of the Blood Veſſels, Ducts, Valves, &c. in the Kidneys and Ureters, and they are contracted, or ſhut till the Blood be repleniſhed with thin Fluids, and Juices, to make the Glands in their Valves ſecrete, and the Valves open. When the Steam, keeps the Guts extended very much, they preſs upon the Bladder, and make it capable of containing a leſs Quantity of Water, and conſequently there is a Neceſſity of diſcharging it oftener. When we diſcharge the Water out of the Bladder, the Steam and Excrements frequently puſh downwards, along the Guts into the Space, in which the Bladder filled with Water was contained, and cauſes us to break Wind, or have an Inclination to a Stool. Urine in a Veſſel kept in Fuſion by the Corpuſcles of Heat in the Day time, or by the Steam and Spirits in it, continues clear. But when it has ſtood long, and the Steam and Spirits evaporated, or in the Night, when the Corpuſcles of Cold clog the Bodies, they precipitate, and the Urine becomes thinner at the Top, and thicker at the Bottom of the Veſſel. The moſt volatile Parts of any Matter taken into one's Stomach, when the *Pilorus* is open, are in an Inſtant, carried along with the Steam

How, and when, Urine lets fall its Sediment.

into all, even the moſt diſtant Parts of one's Body, and affects all the Parts of the Body with much the ſame Senſe, as thoſe Steams would do one's Palate, if they were belched upward, the different Magnitudes of the Glands, and their Nakedneſs or Coverture conſidered. And the Glands in the Mouth generally make an Eſſay for the reſt, that which excites the Glands in the Mouth to open or ſhut, &c. will do the ſame, in a greater, or leſs Degree, to the reſt. That which wounds, cuts or corrodes the Glands in the Mouth, will have the ſame Effects in other Parts, even from the ſofter Salts to thoſe we call Poiſon, which when in the ſmall Veſſels are forced by the Steam, cut them, and burſt out into Parts, where they and it cannot paſs, ſo ſwell the Parts and ſtop Circulation. Indeed there are ſome natural Bodies, and ſome Compoſitions, which have Corpuſcles in them, that are not freed by the ſmall Heat, nor in ſo ſhort a Time as Things ſtay in the Mouth, which will be freed in the Stomach, and act according to their Qualities.

CHAP. XXVI.

The Uſe of Sweats and Bathing, how they operate, &c.

THE Intention of raiſing a Sweat, is to remove ſome Obſtruction in the Paſſages, or extend, or open them, or to melt, or diſſolve, or thin ſome Juices which are ſtorkened, ſtagnated, or thickened in ſome Part, or all over the outward Parts, or to open the Pores, or diſcharge ſome cold watery Juices out of the Blood, &c. which is generally occaſioned, by cooling too ſuddenly, after one hath been very hot, and generally called a Cold. If it be all over the Body, the Steam meeting with Obſtructions, cauſes a burning Heat for want of Vent. If it be in one Part of the Body, becauſe the Blood cannot circulate, nor the Steam get Vent there, it ſometimes occaſions what they call a Fever; ſometimes Pains which they call Rheumatiſms, &c. The Time for taking any thing to raiſe a Sweat, ſhould be when the Meat and Drink is well diſſolved and digeſted, there ſhould be Corpuſcles in the ſweating Medicine, which will excite a briſk Steam; and the

The Uſe of Sweats.

the Preſſure and Motion of the Air ſhould be kept off the outward Parts to ſuffer the Heat within to perſpire, and to reflect it ſucceſſively againſt the Body, thereby to increaſe the Heat. If the Matter, which offends, be moſtly in the Stomach and Guts, and but Part of it be got off into the Blood, a Sweat may throw it off too ſuddenly, and if there be much of it, cauſe great Inconveniences. If the offenſive Matter be moſtly in the Blood, a Sweat may carry off too much of the Juices out of the Stomach and Paſſages, or carry too craſs Matter into the Blood, or diſſolve ſome of the tender or fat Parts, or only diſcharge the moſt fine and ſubtile Juices, and not diſcharge the groſſer ſo well as a Sweat raiſed by Action, which when a Perſon can endure it, is doubtleſs the moſt natural and advantageous. When the Stomach and Guts are full of Meat and Drink, eſpecially if the Drink be ſtrong, violent Exerciſe is in Danger of hurrying too craſs Matter into the Blood; and when the Stomach and Guts are ſo filled, and extended with Steam, ſtooping frequently, and compreſſing the Stomach and Guts, preſſes out the Steam, and makes one ſweat more than any other Exerciſe. As the Sweat, or Juices cannot

Cautions about Sweating.

cannot iſſue out of the Pores or Glands in any Part, but where the Force of the Steam within, is greater than the Force of the Air without; nor inward, but where the Force of the Air without, is greater than the Force of the Steam within: So a leſs Force of the Steam within, will make the Sweat perſpire, when one's Body is covered, and the Preſſure of the Air kept off, than when one is in the open Air. And if one uſe Exerciſe till one be very warm, drink a little warm ſtrong Drink, and cover one's ſelf in Bed, it will make one ſweat exceſſively. When one hath ſweat in Bed, or without Action, as ſoon as the Air comes to the Skin, it preſſes the clammy Matter to the Skin, ſtops the Pores, and as it dries, forms a Skin upon their Mouths, becomes a natural Defence whilſt their Mouths are open, and afterwards rubs off in Scales. If the Pores be ſtopt with phlegmy or ſcaly Matter, or the Juices in the outward Parts be too thick, or ſtagnated, or not well mixed, perhaps Friction with a coarſe Cloth, or ſoft Bruſh, may cleanſe and open the Pores in the Skin, remove the Obſtructions, open the Paſſages, break the Clods, thin, and mix the Blood as effectually, as Exerciſe or Sweat-

Friction ſometimes preferable to Sweats.

When to be done.

Sweating. But this muſt be done at Evening, or when the outward Parts are cool, for if it be done in the Morning, when one riſes hot out of Bed, it leaves the Parts hot, and the Mouths of the Pores will afterwards ſtand full of red Humours like Pimples. Bathing in hot Water does much the ſame thing as ſweating in Bed, only the Fluid cleanſes the Mouths of the Pores in the Skin, more effectually from what was there, and what iſſues in Sweat, during bathing. When you have waſhed the ſtagnant Juices out of the Pores, the Air preſſes them together, and the Parts contract, and become more denſe or cloſe. Sweating after bathing in a cold Bath, hath much the ſame Effect, as to that Part. But when one is ſuddenly immerſed in very cold Water, the additional Preſſure of the Water and Cold, puſhes the Blood and Steam forcibly inward, and the Juices into the Stomach and Guts, eſpecially if they be not too full of Meat, or Drink, or Steam, extends or opens the inward Veſſels in a Moment, and by keeping the Pores ſhut, gives the Steam, farther increaſed by the Juices, an Opportunity to extend them farther, till in a little Time after one is out, the Steam riſes to ſuch a Height,

Of warm Bathing.

Of cold Bathing.

Height, that it puſhes the Blood outward, makes the outward Parts ſenſibly hot, and if one be covered, throws one into a Sweat. This may remove Obſtructions, and open the inward Veſſels more effectually, than ſweating by Medicine, or Cover, or Exerciſe. But if there be much noxious Matter in the Stomach or Guts, to be thrown out of the Blood, or into them, will occaſion like Inconveniences as other Sweating doth. 'Tis ſaid, bathing in cold Water often ſhuts the Pores, and prevents one from taking Cold: but I rather think that it opens the Veſſels within, and makes them not ſo liable to obſtruct the Juices, when they are thickened by Cold; and doubtleſs, it is by opening the Veſſels, and giving the Blood and Juices Paſſage, that it cures the Rickets, Weakneſs in the Limbs, &c. and it doth this the moſt effectually in Children, or timorous People, which are moſt frighted or ſurpriſed, and make the greateſt Effort and Struggle to get out, and thereby augment the Force of the Steam. When the Steam is ſtopped ſuddenly in any Part, as by putting the Hands, or Feet into cold Water, it preſſes more on the other Parts, and moſt ſenſibly on the Bladder, or elſe

A Remark upon cold bathing contrary to the received Opinion.

The Reaſon for the Increaſe of the Secretion of Urine in the cold Bath.

elſe it condenſes the Steam in the Bladder, and lets the Air preſs in Juices, and contract it, and inclines one to Urine. When one continues any Part, long in cold Water, it makes one urine, by condenſing the Steam as it circulates, and make more of it diſcharge that Way.

Partial Bathing or Fomentation.

Bathing or fomenting any Part, with hot ſpirituous Liquor, is to inſinuate the Corpuſcles or Steam of the Liquor into the Part, extend and open the Veſſels and Glands, dilate or melt the thick or ſtagnant Juices, and enable the inward Steam to diſcharge or circulate them in the Blood.

The Uſe of Salt or mineral Bathing.

Bathing in ſalt, or mineral Waters, either hot or cold, is to inſinuate the Corpuſcles of the Salt, or Mineral into the Pores, to open the Paſſages, thin the Juices, clog or ſheath the Juices, which are too ſharp, &c. according to the Quality of the Salts or other Minerals, or the Mixture of them in the Water.

CHAP. XXVII.

The Uſe of Bleeding.

The Intent of V. S.

THE Intention of Bleeding is to diſcharge a Quantity of the Blood, when there is too much, or when it is too craſs, that it cannot circulate and preſs the capillary Veſſels without Pain; or when ſome of the Veſſels are bruiſed, or broken, that it preſſes too much, or gets Vent that Way; or when there are ſome ſharp Salts in it, which fret and cut the ſmall Veſſels, more when they are extended, than they would do if the Veſſels were leſs extended; or, when the Veſſels in ſome Part, are ſo filled with thick Blood, that they compreſs the ſmall Nerves, and cauſe Stitches and Pain; or, at the beginning of a Ferment, by Matter in the Stomach; or, by too many Juices iſſuing into the Stomach, which is in danger of expanding it, ſtretching the Veſſels, and hurrying the Blood too much, or when the Steam is ſo weak, that it cannot thin, or circulate ſo much Blood. Immediately, as ſoon as the Blood is diſcharged, all the Blood-veſſels are ſtraightned, the Air compreſſes thoſe in the outward Parts, and withdrawing Part of the Blood out of the Veſſels in the Sides of the Stomach and Guts, ſuffers the Stomach and Guts to be extended by the Steam; and the Courſe of the Circulation being altered, makes a ſort of a Stop, before the Steam can force it to take its uſual Courſe, and that makes thoſe

The Effect.

thoſe Perſons, where the Steam is weak, deſperately ſick during the Time. If the the Steam be ſtrong, the Vacancy made by the Diſcharge of the Blood out of the Blood-veſſels, gives the Steam an Opportunity to diſcharge a greater Quantity of the Matter in the Stomach and Guts out into the Blood, and that Matter will have the common Effects, according to its Quantity and Quality, the Contexture of the Blood, the Conſtitution of the Veſſels, and other Circumſtances.

Of Bleeding at the Noſe.

Sometimes, a Pain in the Head, which has continued for ſeveral Days, will go off, upon bleeding a ſmall Quantity at the Noſe. What occaſioned the bleeding, and whether that Occaſion, or the Diſcharge of ſo much Blood, wrought that Effect, deſerves to be conſidered. If an Increaſe of Steam, or finer Steam, or Steam mixed with ſubtler Juices, thinned the Blood, extended the Veſſels, and removed the Obſtruction, and by riſing a little too high, forced the Veſſels in the Noſe, that Blood might have been circulated, and the Obſtruction have been removed without diſcharging it. And bleeding was only an Evidence of ſuch an Operation, or of its going too far. If that Blood were immediately diſcharged out of the Veſſels which were ſtop'd, or too much extended, it might give them Opportunity to contract, and ſo be an Aſſiſtant in removing the Pain.

CHAP. XXVIII.

The Uſe of Cupping and Scarifying.

The Intention and Manner of performing, and the Effect of Cupping.

THE Intention of Cupping and Scarifying, is to diſcharge ſome ſtagnant Juices out of ſome particular Part, or ſome of the thinner Part of the Blood, when it abounds too much. 'Tis performed by applying a hollow Veſſel to the Part, and diſcharging Part of the Air out of the Veſſel, which takes away Part of the outward Reſiſtance, and gives Liberty to the Steam within, to force ſuch Part of the Juices and Blood, as will enter into the Veſſels in that Part, to fill the Veſſels and extend them, and the covered Part, and lancing or cutting the Skin and Veſſels, gives the Steam an Opportunity to diſcharge the Blood and Juices; and it hath much the ſame Effect as bleeding, only it may take away more of the Juices ſtagnant in that Part; or, if there be none ſtagnant in that Part, more of the thinner Part of the Blood, and

Qu. Concerning encreaſing the Preſſure upon any Part or the whole.

leave the Remainder thicker. If a Gut or Bladder were fixed upon any ſwelled Part with a Frame, or tied at each End, and ſecured with ſome cleaving Matter, that Air could not get out, and more Air were forcibly pumped in, ſo as to make a ſtrong Preſſure, what Effect would it have? Would it not repell the Humours, make them circulate, and contract the Part? Or, if a Man were put into a large Veſſel, and Air pumped in, and the Preſſure made ſtronger, would it not force the Juices into the Sides of the Stomach and Guts, and the contrary, ſee p. 49.

CHAP. XXIX.

The Uſe of Bliſtering.

The Uſe of Bliſters, and how raiſed.

THE Intention of Bliſtering, is to diſcharge ſome of the thinner Juices out of the Blood, when a Ferment hath thinned the Blood too much, or when there is too great a Quantity of ſmall ſharp Salts, or other like pointed Bodies in the Blood. And is performed, by applying ſome ſharp Corpuſcles to the Skin, which will open, and cut, the capillary Veſſels which compoſe the cuticular Glands, &c. and by a Plaiſter, or ſome cleaving Matter

ter, which will keep off the Air, and ſuffer the Steam to open the Pores, and thoſe Corpuſcles to enter, and be moved by the Steam in the Juices of the Glands, and that which they diſcharge. And after their Operation, and the Skin's being taken off, by continuing a Plaiſter of ſome cleaving Matter to keep off the Air, and ſuffer the Steam to diſcharge the Juices at the Ends of the cut Glands, and to prevent the Air and Fire, Salts, &c. in it, from wounding the Ends of the Glands, or drying the Juices which iſſue out, and preſſing them into a dead Skin or Scab, which would ſtop the Diſcharge. If Occaſion require they repeat ſome ſmall Quantity of ſharp Corpuſcles mixed in the Plaiſter, which will gently open the Pores, when applied to the Skin, or to the Ends of the cut Glands, to encreaſe the Secretion, or add Corpuſcles of the contrary Quality to decreaſe it. Whether a Bliſter diſcharge ſome volatile Salts, or &c. which will not ſubſide, and go off by Urine, nor at the outward Pores, but only into the Stomach; or whether taking ſome away, only leſſen the Quantity which would have been ſecreted into the Stomach, and conſequently the Sharpneſs of the Ferment; or whether they fretted the

Qu. As to the Matter diſcharged by them, and their Effects.

the Glands in the Blood-veſſels, and made the ſubtle Juices in them, ſecrete too much, ſo as to diſorder the Conſtitution of the Blood, as Vinegar, which though not viſibly prejudicial to the Stomach, yet is mortal when injected into the Blood, and leſſening their Quantity abate that Effect, I have not had Opportunity to obſerve. Doubtleſs, ſome of the ſharp Corpuſcles applied in the Bliſter, will, as they enter into the ſmall Blood-veſſels, be carried along with the Blood to all Parts of the Body; and will have various Effects upon the different Parts, according to their different Conſtitution; and will more, or leſs open, or wound the Glands, and cauſe Secretion in all Parts of the Body, till thoſe Corpuſcles be blunted, ſheathed or diſcharged. And when the Glands in the Stomach, Guts, or Blood-veſſels, are opened to a great Degree, or as it were wounded, they will iſſue Juices againſt a great Strength of Steam for a while, as the ſmall outward Veſſels will do Blood or Juices, when they are wounded or cut, againſt the Preſſure of the Air; becauſe where the Parts are cut, there are no Valves to ſhut. 'Tis not ſtrange, that thoſe Corpuſcles ſhould paſs, if thoſe of Oil of Turpentine only touching the outward Skin can inſinuate themſelves, ſo into the Pores, and thence into the Blood-veſſels, that the Urine ſhall ſmell ſtrong of it. The Matter diſcharged by the Bliſter will be compoſed of Corpuſcles of that Magnitude, or Juices of that Conſiſtency, which the Glands or capillary Veſſels, opened or cut, could diſcharge: For if the Paſſages, as one may ſay, in the ſeveral Strainers were not of different Sizes, the Juices, ſecreted in each Part, would be the ſame. When any one hath a Bliſter, outward Wound, or is accuſtomed to have the outward Piles upon a ſudden Stoppage of the Pores in any other outward Part, as by ſhaving the Head with cold Water, going wetſhod, Abſence of Cloaths, or other Defence from the Cold, the Steam within, acts more forcibly upon the weak Parts, which are kept warm; and the bliſtered Place, or Wound, will run, or the Piles break out, and bleed more than they would otherwiſe have done. Increaſing the Force of the Steam within, by ſtrong Drink, Action, &c. will have the ſame Effect. If one have a ſmall Appearance of the Piles after a Stool, preſſing them gently with one's Finger End, will put them up into the End-gut. If that be omitted, Vid. above p. 101.

omitted, till the End-gut be filled with Steam, though you puſh them up, they will return. But if you break Wind, and then put them up, they will not return; ſo 'tis likely, when one hath the Piles, if one put up a Pipe with Holes in the Sides, and let off the Steam, one might then put them up. I think it is accounted a bad Sign when Bliſters will not work. If the Steam riſe not, or paſs not, or the thin Parts of the Blood be born off, or the Blood be ſtagnated, Bliſters will have but ſmall Effect, nor the Patient continue long without ſome Change.

Bliſters not riſing, a bad Sign.

CHAP. XXX.

The Uſe of Iſſues, Rowels, &c.

The Uſe and Intent.

THE Intention of making Iſſues, Rowels, &c. is to diſcharge ſome Matter out of the Blood, which is too groſs to be ſecreted in proper Time, at any of the natural Places for Diſcharge, nor at the Glands cut by a Bliſter, but muſt be diſcharged at wider Glands or Veſſels, cut and kept open, and defended from the Air. And ſuch Glands or Veſſels will diſcharge thicker Juices in Proportion to their Capacity; and perhaps, but very little of ſuch Humour as is diſcharged at the ſmaller Glands. See the Deſcription of the Ducts, &c. above. When craſs Matter ſtops any ſmall Paſſages in any of the Blood-veſſels, every Puſh the Steam makes, it, and the Blood puſh againſt the Matter ſtopped, and muſt rebound back, and take the next Paſſage behind to circulate; and by Degrees more craſs Matter lodges in the Veſſel between it, and the next Paſſage behind, and extends the Veſſel. If the Corpuſcles of the Matter be blunt, they ſwell the Parts; if ſharp, cut them, and are extravaſated, cauſe Pain; and if they ſtop while they ferment, and be ſharpened too much, cauſe Inflammations; and ſome of them cut their Way, or get Paſſage into the Blood, affect the Stomach, and other Parts, cauſe Fevers, &c.

CHAP. XXXI.

The Uſe of Plaiſters and Ointments.

The Uſe.

THE Intention of applying a Plaiſter, or cleaving Matter, to any Part out of Order, or to a Wound, is to keep off the Preſſure of the Air, and ſuffer the Steam to diſcharge what is neceſſary at the Pores, or cut Ends of the Veſſels, and to prevent the Air, Fire, and Salts, &c. in it, from wounding the Ends of the cut Veſſels, or drying the Juices, which iſſue out, into a dead Skin or Scab, which would ſtop the Diſcharge. Effect. The Effect of the Plaiſter is various, according to the Corpuſcles mix'd in it; if they be ſharp, the Mouths of the Veſſels will be kept open, and make a great Diſcharge; if contrary, they will have contrary Effects, &c. When the Veſſels are torn, and ſome broke inwardly, the Wound is more difficult to be healed, than when they are cut in a Line, becauſe the Ends of thoſe broke inward cannot be come at by the Plaiſters, the Air, or any Thing applied outwardly to ſtop them. Uſe of Ointments. The Intention of uſing Ointments, is very different, according to the Compoſition and Qualities, of the Corpuſcles in the ſeveral ſorts of Oil, or of thoſe of various ſorts of Matter mixed in them. Thoſe of ſoft Parts, keep the Humidity or Moiſture from evaporating, and keep the Parts ſupple. Thoſe, which have ſpirituous Corpuſcles in them, enter at the Pores, and do much the ſame thing, as Spirits do in Fomentation. Thoſe, which have Corpuſcles of ſharp Salts in them, corrode the Parts, &c.

CHAP. XXXII.

The Uſe of ſmoaking or chewing Tobacco, &c.

THE Intention of ſmoaking or chewing Tobacco, or, ſuch Things as open the Glands in the Mouth, ſhould be to diſcharge the Saliva or Spittle, out of the Glands of the Mouth, when there is too much of it in the Blood, or it flows into them, in too great Abundance, or is too craſs, or too ſharp, &c. Any Thing that hath Juices or Corpuſcles in it, which open the Glands in the Valves, which ſhut thoſe Glands, thereby weakens the Valves, and gives the greater Glands Opportunity to diſcharge. If thoſe Corpuſcles reach the Valves in the Throat, they open the Glands which compoſe them, ſo weaken them, and makes one like to vomit. Thoſe, which only reach and open the Glands in the Mouth, may by the Juices, iſſuing out of thoſe Glands, one after another, ſucceſſively downward into the Stomach, open the Glands, and let the Juices ſecrete there, and thoſe ſtill

The true Uſe of ſmoaking or chewing Tobacco.

The manner how they operate.

ſecrete downward; and as it doth often, occaſion at firſt an Inclination to vomit, and afterwards to a Stool. Or, that Juice may raiſe ſome little Ferment in the Stomach, take off the Senſe of Hunger, and make one briſker. But it is likely, the frequent Uſe of it, widens the Ducts that ſecrete the Juices out of the Blood, into the Glands of the Mouth, contracts thoſe Glands by diſcharging them, before they are full, and thereby diminiſhes and weakens the Parts of the Mouth, alters the Qualities of the Juices by making the Ducts wider, and by taking them away before they have reſted, and, as one may ſay, been digeſted or prepared by ſtaying a due Time in the Glands, or before they be duly ſeparated out of one into another, or ſome back into the Blood, and perhaps leſſening the Quantity neceſſary to ſupply other Parts, for other Uſes. And if it do the ſame Thing in the Stomach, it waſtes the Juices by ſmall Quantities, and leſſens the Stock which ſhould diſſolve the Meat at Meal Time, and ſo does all little Quantities of Coffee, Tea, &c. 'Tis poſſible, ſome ſmall Quantity of the ſmall ſharp Corpuſcles in the Tobacco, may enter in at the Glands, and ſo into the Blood, and be circulated in it.

Of the too frequent Uſe.

But ſo ſmall a Proportion of them will be diſtributed to the Stomach, that the other ſeems more likely, yet they may contribute jointly. The Corpuſcles in different Bodies and Fluids, either open the Glands in different Parts of the Mouth, or different Glands in the ſame Parts, or open the ſame to a different Degree of Wideneſs, ſo that different ſorts of Juices iſſue: As Smoking produces Phlegm; Chewing, Spittle; Salt or Allom, a Fluid as thin as Water. And it is likely the Caſe is the ſame in our Stomachs, for ſtale Beer makes one ſometimes puke an acid pungent Juice; Oil, a bitter Phlegm, &c.

CHAP. XXXIII.

The Uſe of Snuff.

The Uſe of Snuff.

THE Intention of taking Snuff is to open the Pores in the Noſe, &c. and let the Steam diſcharge the Juices out of the Glands, or to make one ſneeze. Whether the Juices diſcharged there make other Glands open, and diſcharge Juices ſucceſſively downward to the Lungs, and thoſe Juices fall upon, and ſtop the Pores there, or whether ſome of the Particles

The Effects.

of Snuff when taken, or ſome Salts or Corpuſcles in the Air, or the Steam iſſued out of the Glands opened in the Noſe, paſs down towards the Lungs, open the Glands, and make them ſecrete, I am not certain. But when any Thing opens the Pores in the Noſe, the Steam makes a Stop, extends the Lungs, and breaks out with ſtrong Efforts to remove the Agents which offend. When the Steam is weak, or heavy, Admiſſion of Cold to any of the outward Parts, ſtops the Steam there, and cauſes it to preſs harder upon the Glands in the Noſe, and open them, and preſently there ſucceeds a Stoppage, and thoſe Efforts in the Lungs, or upon them, which we call Sneezing. Shutting the outward Pores by Cold, makes a greater Quantity of Steam neceſſary to be diſcharged at the Lungs, which occaſions Sneezing, by increaſing Inſpiration ſuddenly, as is deſcribed below. The Neck of the Wind-pipe is ſo contrived, that when any Thing touches it, it ſhuts, or when the Duct to the Stomach opens, it ſhuts, elſe Fluids, &c. would get down to the Lungs. When any of the Parts about the Throat are ſwelled, and the Glands ſtraightened, they ſecrete ſharper Juices, which we call Rheum, which wounds or tickles the Parts. And when any Thing touches or offends the Neck of the Wind-pipe, the Lungs extend, and the Air and Steam are puſh'd forth with ſtrong Efforts, which we call Coughing, to remove the Agents which offend. When the Blood is too phlegmy or too ſharp, that it ſtops and offends the Lungs, it occaſions like Efforts; for extending the Lungs, depreſſes the Diaphragm, which returning ſuddenly to its natural Situation, makes thoſe Efforts, compreſſes and jirks the Stomach, which heightens the Ferment, and by ſudden Puſhes, forces the Matter downward, or into the Blood, and along every Paſſage in the Body, and the like Matter out of the Lungs upward. Whether ſtopping or ſtraightning the Neck of * the Wind-pipe makes the Wind and Steam in the Lungs make the Effort; or, whether ſome Juices get down, and obſtruct the Steam from iſſuing out of the Lungs, and its breaking out makes that Effort; or, whether upon offending the Muſcles they make that Effort, I am not certain.

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* A convulſive Reſpiration occaſions Sneezing, as from a violent and quick Return of the Diaphragm before depreſſed, by a deep Inſpiration, or a full Dilation of the whole Thorax.

CHAP. XXXIV.

The Uſe of Alkalies, Abſorbents, Aſtringents, Sweetners, Opiates, &c.

Their general Effects.

THERE are abundance of Medicines which they call Alkalies, Abſorbents, Aſtringents, Sweetners, Opiates, &c. which either ſtop the Mouths of the Glands which ſecrete the Juices into the Stomach, &c. or entangle or ſheath the Agents, or adhere to and load them, ſo that they cannot move, or move but ſlowly; and whenever any, or all of theſe are done, there is a Stop or Diminution, put to the natural Diſcharges of the Excrements, &c. and whether the Juices be ſtopped in the Glands, or the Agents clogged in the Stomach, Guts, &c. tho' it be even by Jeſuits Bark, the moſt powerful of them all, whenever a Purge or any Thing opens the Glands, or divides the Agents from their Clogs, the Fever or other Diſorder returns. And if the Agents have been long ſtopped, and their Number or Quantity increaſed, the Diſorder is increaſed in Proportion. And if they be not ſome Way diſcharged, they get looſe by Degrees, and do Miſchiefs of

PAGE 264. LINE 19.

By Aſtringents or Stypticks, we underſtand ſuch Medicines as are uſed to, and do reſtrain or ſtop any Loſs of Blood, from whatever Cauſe ſuch Hæmorrhage ſhall be produced ; but how theſe Medicines act in our Bodies ſo as to produce ſuch a Stoppage, is no where ſatisfactorily explained, and I believe never will without admitting Mr. *Hutchinſon*'s Theory ; let us ſee what the beſt authors ſay of them. Dr. *Mead* in his very ingenious Treatiſe, *De Imperio ſolis & Lunæ*, ſays in Caſes of inordinate Fluxes of Blood, we muſt take our Remedies from the Claſs of Medicines, " *quæ dilatatas ultra modum fibras reſtringunt & coercent*," and in the ſame Page, he ſays, as if it were the received Opinion, " *porro cum efficaciſſimæ Liquoris arterioſi efferveſcentiam, qua diſtenduntur vaſa, reprimat & compeſcat Cortex Peruvianus*," And in his laſt moſt accurate Treatiſe on the Small-Pox, in the Bloody Sort, he ſays, if there is any Room for Medicine, " *iis remediis pugnandum eſt, quæ vi ſua Styptica Sanguinem quodam modo cogunt, & ita ſupprimunt, ut ne minimas quidam Arterias perrumpat*." The Way to theſe *Minimæ Arteriæ*, muſt be by the common Road of the Circulation; but if the leaſt *Coagulum* in the Blood, or Tendency to it ſhould happen before it paſſes the Lungs, theſe would be obſtructed fatally, ſo that it is impoſſible the ſtyptical Virtue of any Medicine, can paſs, really, as ſuch, into the Blood ; becauſe by this very Virtue itſelf, it is evident, it muſt ſtop its own Paſſage long before it reaches the Veſſel upon which it is ſuppoſed to operate. Much leſs will they ever be ſhewn immediately to criſp or conſtringe the Veſſels, ſo as to make them keep in theſe Humours, which by too great a Dilatation, they are thought to let out. *Boerhaave*, ſeems to be aware of the Conſequence of this Doctrine, (tho' he teaches it himſelf) and gives a Caution as to uſing this Sort of Medicine. In Paragraph 1107. of his *Pathology*, he recites this Claſs of Medicines ; in 1108, he tells you when they are of Uſe, and 1109, he tells you, to be very cautious in adminiſtring them, " *ex conſideratione certi experimenti quo ſcimus auſtera in primas vias, nimis, in interiores difficulter agere*;" he had ſaid the Truth, had he confined their

Action only to the *Primæ Viæ*, further than which their own Nature will not allow them to go, and when there, known Operation will unriddle their whole Power, and leave us no longer in the Dark about them, *viz.* they check the Steam, *i, e.* in our Stomach and Guts (they act, as is known this whole Claſs does in Fermentation) they ſuſpend or greatly leſſen the Animal Proceſs, ſo little or no Steam is generated during their Action, or by being in Contact with the Lacteals, may conſtringe them, ſo as to let no Steam go off, perhaps both theſe Effects may be produced; and if thus the Agent be ſuſpended *ab officio*, by the Bark, for inſtance, then *Effervescentia Liquoris Arterioſi efficaciſſime compeſcetur*. And as a further Evidence of their Operation being confined to the *Primæ Viæ*, it is known their Virtue ceaſes upon the leaſt Purging, whether it happen then naturally, or be unſkillfully procured.

N. B. This *Note* coming too late to the Preſs, the *Binder* muſt obſerve to place it between Page 264, and 265.

of other Sorts. Since we cannot ſee the Operations in the Stomach, Obſervations and Experiments ſhould be made, how Agents, which we ſuppoſe to be in the Stomach, Guts, &c. act upon ſuch Matter as we put into the Stomach, where we can ſee them, before we make Experiments with them there. And Experiments ſhould be made upon Brutes, to know what Effects the ſeveral ſorts of Diet have upon their Stomachs, whether it be poſſible to contract their Stomachs, and cauſe the Glands in them to be repleniſhed with Juices, and then take out their Stomachs before the Juices ſecrete, to try what Effects thoſe Juices will have, put into the Stomach of a living Brute of the ſame Species. Thus to put the Juices in the Stomach of a Calf, of which they make Rennet, into the Stomach of another live Calf, &c. or to try what the Juices of the lower Guts would do, if they were injected like a Clyſter, or what the Gall, or other Juices put into the Stomach, &c. would effect.

Obſervations and Experiments ſhould be made upon theſe Medicines.

CHAP.

CHAP. XXXV.

Conjectures about the Uſe of Bitters.

Our Juices and Bitters.

AS our Bodies are framed to ſecrete great Quantities of Juices into the Gall-bladder, Pancreas, and Glands in the Stomach, and ſtore them there, 'tis very likely thoſe Juices are neceſſary Agents; and ſince thoſe in the Gall-bladder, and ſome of theſe in the Glands of the Stomach, are extremely bitter, Experiments and Obſervations ſhould be made, what Effects thoſe Juices or Bitters have in Fermentation. The greateſt Uſe we make of Bitters, is to prevent Fluids from turning acid by long keeping, or the repeated Fermentations occaſioned by Change of Seaſons, &c. and preſerve fluid Juices fit for Nouriſhment, as Salt doth Fleſh and other Solids. Whether theſe bitter Juices are intended, to prevent the Juices or Excrements within us, from turning too ſour by Fermentation, &c. or what other Uſes they are intended for; how they perform that, or their other Operations; what Effects they have when mixed with volatile Salts, acid Salts, Sea Salts, Oil, Phlegm, &c. in a fermenting

Fluid, deſerves to be tried, obſerved and conſidered. Whether they adhere to, clog and balance ſome acid Corpuſcles, which divide the Bodies in the Fluid too ſmall, and free other ſharp Bodies, ſo as to render the Fluid acid; or, whether they aſſiſt in dividing the Bodies in it to ſuch a Degree of Smallneſs, as may prevent their Precipitation. They ſeem to be very ſmall and penetrating, but in Time they ſheath themſelves in ſomething in the Fluid, and they loſe their Effects upon our Palates, and their Effects are at leaſt, not ſo ſudden upon our Stomachs. Almoſt all Sorts of Bitters, taken naked into the Stomach, heighten and thin the Steam, and perhaps irritate the Glands in the Stomach, and make them ſecrete. At what Time the Gall-bladder and Pancreas iſſue their Juices into the Duodenum, whether when the Steam is weakeſt there, and ſo the Juices are the leaſt reſiſted; or, when the Steam is ſtrongeſt in the Duodenum and upper Guts, whereby their Poſition may be altered, or their Juices preſſed out. This might, if aſcertained, lead to diſcover their Uſes, whether they be to heighten or ſlacken the Ferment. If the Juices in the Gall-bladder and Pancreas be diſcharged only into

What they ſeem to do.

into the Guts, 'tis very likely their chief Uſe is to prevent the Excrements, which ſometimes undergo a long Fermentation there, from turning acid. And 'tis like ſome Poſition of the Guts, which the Condition of the Contents puts them into, when they want this or that Juice, gives it an Opportunity of venting into them. See p. 85. and the whole Chapter.

CHAP. XXXVI.

Obſervations upon, and Compariſons between the Effects of volatile Salts, and Sea Salts or fixed Salt.

ALL vegetable Matter contains active, and volatile Salts and Spirits, ſome acid, ſome pungent, ſome ſheathed or blunted, but all entangled with Corpuſcles of the Plant which contains them, ſo as to affect our Palate with various Senſations, as hot, bitter, ſour, ſweet, &c. and our Noſes with various Smells. All freſh Water contains ſome mineral, and ſome vegetable Salts, and all Creatures live upon vegetable Matter or Water, or upon the Fleſh of one another; and the Juices of Plants, Vegetables and common Water, yield little Sea or fixed Salt. No Creature but Man, eſpecially of thoſe at Land, or in the freſh Rivers, which we live moſtly upon, except Pigeons and Bees, uſe Sea Salt in their Food. Nor does any Creature but Man prepare Meat by Fire, and though Fire bear off ſome of the volatile Salts, and the moſt volatile Part of the Juices in the Meat, yet it agitates, and divides, and frees, more of the active and volatile Salts, remaining in the Meat, from the Corpuſcles of the Meat, and the Corpuſcles of the Meat from one another; makes the Salts more ſharp and active, and the Meat more eaſy to be diſſolved, and does much the ſame Thing, as the Sun does, in ripening Fruits, &c. only the Sun does it more leiſurely, and preſerves the fine Juices. Man extracts, and prepares, and divides his Drink by Fire, Diſtillation, Fermentation, &c. eats and drinks more volatile Salts and Spirits, and more freed from animal or vegetable Matter, and more ſharpened by ſuch Extractions and Preparations, than any other Creature. Man eats moſt of his Meat, and drinks ſome of his Drink hot; keeps his Body more defended from the Air by Cloathing, Houſes, Bed, Fire, &c. and conſequently hotter than any other Creature. Citizens, more than Country People, where

Obſervations upon human Diet, and the Manner of preparing his Meat.

Upon his Drink.

His manner of uſing his Victuals.

Of his keeping himſelf as to Warmth.

where the Air is more repleniſh'd with volatile Salts, Corpuſcles of Fire, &c. raiſed by the great Number of Fires, reſpired from the People, &c. and the Air thereby leſs able to diſcharge ſuch from the Lungs, &c. Country People more than the wild *Indians*, &c. The Stomachs of Brutes, which live upon cold raw Plants, nay, ſome of them, without drinking any Fluid, can digeſt them. The Stomachs of Brutes, which live upon dry Vegetables, and ſimple Water, can digeſt them. The Stomachs of Brutes which live upon raw Animals, and drink a ſmall Proportion, or no Fluids at all, can digeſt them, Bones and all. And all of them diſcharge their Excrements regularly; why ſhould Man with Reaſon to chooſe, and with Choice of all Sorts of prepared Diet, Aſſiſtances of being kept warm, Skill of Phyſicians, &c. digeſt his Meat worſe, diſcharge his Excrements with greater Difficulty, and be liable to more Diſorders, and more difficult to be ſet right, or be fed fat at Pleaſure, than any other Creature? And more now than formerly? It cannot be for want of volatile, or active Salts or Spirits, that Man's Stomach digeſts not ſo well as thoſe of Brutes; becauſe Brutes and Savages, who lie

Brutes, and their Living.

Why Man's Health leſs conſtant than theirs?

lie out in the Cold, need moſt of them; and Man in Cities, Towns, &c. takes in more of them, and more freed, or ſharpened than any other Creature of his bigneſs, or in Proportion; and becauſe we uſe a greater Quantity than formerly in Sugar, Spirits, Brandy, Rack, Rum, Wine, Spices, Coffee, Tea, &c. and becauſe Phyſicians preſcribe volatile Salts and Spirits in Cordials, &c. when we are out of Order; and becauſe thoſe who take a leſſer Quantity, digeſt and diſcharge better than thoſe who take a greater Quantity. It cannot be for want of keeping our Bodies hot, becauſe Brutes are kept cooler than we; and thoſe who keep themſelves but moderately warm, and much in the open Air, digeſt better than thoſe who keep themſelves hotter and cloſer. And thoſe who keep themſelves hotteſt, are moſt troubled with Vapours, &c. It cannot be for Want of Exerciſe, becauſe moſt Men uſe more than Brutes do, if they are left to themſelves. Nor can it be in Quantity, becauſe every Brute eats more in Proportion than Man. It cannot be by uſing too much Sea Salt, becauſe we uſe much leſs now than formerly, and Phyſicians forbid the Uſe of it in moſt Indiſpoſitions, and leſs of it is

The Reaſon aſſigned.

uſed by People in great Towns, than by thoſe in the Country. It muſt be in the Quality, or in too great a Proportion of volatile Salts, or Spirits in our Drink; or by their being too much freed by Fire, Diſtillation, Fermentation, &c. and made too volatile, active or ſharp, and by exciting them too much in our Bodies with Heat by Fire, Cloathing, &c. or, by uſing the Liquors prepared by Fire too ſoon before the freed Corpuſcles be ſheathed; or, too late, when by long keeping, or new Fermentations, they are become acid, or thoſe that are reſtored by Mixtures of mineral Poiſons, or for Want of uſing a neceſſary Proportion of Sea Salt with our Meat, or to our Meat, ſome Time before we eat it. It appears, that the more volatile Salts and Spirits we take, and the more they are freed, and the more Heat, the quicker the Ferment will be, and the opener the Pores, and the ſooner the fine thin Fluid will go off. And when they are too much freed, 'tis likely they go off before their Work be done, and leave the craſſer Matter not ſufficiently diſſolved, nor carry it off the Stomach. But if they did do that, one cannot diſcharge them when their Work is done, for they carry off the thin volatile

Matter, out of the Guts and Blood-veſſels, leave the Excrements in the Guts too craſs, and the Blood too thick, or deprived of proper Juices for diſcharging the Excrements, ſo heat and enflame the Parts, &c. Since Cuſtom hath prevailed, and Men will uſe ſuch Things as they have been accuſtom'd to, what is the moſt likely Agent, to temper, blunt, or abate the Exceſs in Quantity, or Sharpneſs or Volatileneſs of thoſe Agents? Since Mankind did always uſe Sea Salt, and more lately than now; and ſince Phyſicians forbid the uſing as much of it as was uſed formerly, and almoſt forbid it in all Diſorders, and ſince it is their Intereſt to forbid all Things which preſerve us in Health, for what End, did Man always uſe it? and what Effects hath the Uſe of it, firſt, without the Body where we can ſee it? If the Abyſs be as large as ſome think, and repleniſhed with the ſame Proportion of Salt as the Ocean, and there be ſuch vaſt Rocks of Salts in many other Parts, as thoſe diſcovered, perhaps there may be one fourth as much Salt, as there is of all terreſtrial Matter. And to what Uſes, God created ſuch a Proportion of this Globe Sea Salt, hath not, that I know of, been hinted at. The mine- Sea Salt.

ral Salts and Corpuſcles riſing by Springs, and the mineral and vegetable Corpuſcles riſing in Steam, fall down; ſome, upon the Ground, and ſome, run in the Water, and it carries them, and others it meets with, into the Sea, and thoſe muſt be raiſed thence, or circulate through the Earth upward again. And the Water muſt leave, as well as take off mineral, vegetable Matter, &c. Whether, the Salt be to make ſome Ferment in the Abyſs, in order to ſend up the Steams for Rain, Springs, &c. or to prevent Heat, and the more volatile Salts from aſcending, and bearing up the Steam for Rain, &c. too faſt, or to what other Uſes, beſides thoſe we make of it, I undertake not to determine; nor for what other Uſe, that ſort of Salt or Spirit we call Bittern is deſigned, which abounds ſo in it. But doubtleſs theſe, and the ſeveral other ſorts are Agents, ſome to excite, and ſome to abate that Ferment, which raiſes the Steam, makes the Water circulate, and this Globe habitable. And the Heat of the Sun bearing off the Water, and leaving the Salt dry upon the Coaſts of all hot Countries, where they cannot preſerve their Fleſh, Fiſh, &c. without it, ſeems to hint, that that was one of the Uſes for which

Conjectures about its Original Uſe.

which it is prepared. We ſee, that the volatile Salts in the Juices of the Fleſh of dead Creatures, who uſed no Sea Salt whilſt alive, agitated by the Heat of the Sun, and Preſſure of the Air, expand the Tubes and Parts, burſt them, cut, and diſſolve the Fleſh, and bear off Particles of the Fluid and Fleſh, till none remain; and that they are fermented, freed, and ſharpened to that Degree, that in ſmall Quantity, they are very nauſeous, and in great Quantity and Degree, infectious. And thoſe Bodies have moſt volatile Salts, or Spirits in them, or where they have been moſt fermented by the Diſeaſe they died of, or where they have been killed by thoſe volatile ſharp Salts, which we call Poiſon, which 'tis likely cut the Veſſels in the Stomach and Guts, and lacteal and Blood-veſſels in their Paſſage; and where the Body is ſooneſt divided, they are moſt noxious. Nay, even they are volatilized and ſharpened by the Ferment in ſome Diſeaſes in Man and Beaſt to that Degree, that thoſe which fly off, while the Man or Beaſt is alive, are infectious, and moſt ſo in the hotteſt, cloſeſt Seaſons, when there is little Cold to clog them, or little Wind to diſperſe them. Nay even ſome Vegetables, ſuch as Cabbages, &c. have Juices in them, which agitated by the Heat of the Sun and Air, diſſolve the Plants, and ſend off Steams which are nauſeous, and 'tis likely noxious. And 'tis likely thoſe tender Parts in the Noſe, along which the Air we breathe paſſes, and is an Eſſay whether it be wholeſome or not, by that Senſe we call Smelling, is only affected by volatile Salts, and in various Degrees, by the Quantity, of the Corpuſcles, and the Strength of the Agent which moves them, and in various Manners, by the various Corpuſcles of the Matter which they bear along with them. Sea Salt, well freed from the mineral Salts in it, applied to the Fleſh of any Creature, which had undergone any ſuch Fermentation before it was killed, and after it is cooled, and the Corpuſcles of Fire, and the moſt volatile Salts are gone off, will, by the Preſſure of the Air, be inſinuated into the Tubes and Interſtices of the Fleſh, adhere to, fix and clog the volatile Salts, ſo that the Heat and Air cannot agitate them when joint; and blunt them, that they cannot act, nor cauſe any Diſſolution of the Parts. When the volatile Salts have diſſolved the Parts of the Body too much, Sea Salt will ſcarce fix them, or in great

Its Effects in preſerving Fleſh.

Heat when the Fleſh cannot cool, the Sea Salt will be almoſt agitated, and can ſcarcely fix the volatile Salts and Corpuſcles of the Body. Nay, if a ſufficient Quantity of Sea Salt, be duly mixed by boiling it in Water, it will fix the volatile Salts in Fleſh kept in that Fluid, and hinder them from diſſolving the Fleſh. I know not, whether Sea Salt hath been tried to fix the Juices of Plants in the Air, but it prevents their Diſſolution in Fluids or Pickle. The Salt we call Sugar, ſheathed in a mucous Matter, or the Juice of the Cane, mixed with Bodies divided ſmall, or very porous, will clog the volatile Salts, and preſerve the Body, if they be kept dry, or not very moiſt. But when that Salt is diſſolved, or freed from that, or ſome other Mucus by Fermentation, Diſtillation, &c. it becomes volatile Spirits itſelf. Whether the Ferment in our Bodies frees the Spirit from the Mucus, or divides it ſo ſmall, I cannot tell. Sea Salt, applied outwardly to any Part of the Body, burned, inflamed, or itchy, abates or cures the Inflammation. And I think, Sea Salt will ſtop or abate a Fermentation in Liquor, and hinder volatile Salts from diſſolving any Body in a Fluid, and perhaps abate the vola-

Upon Vegetables.

Sugar prevents Putrefaction.

tile Force of Spirits taken inwardly. People in Sieges, &c. who cannot get Sea Salt, but eat their Meat without it, are affected with Scurvy, Itches, * Laxes, Fluxes, &c. and when they get Sea Salt to their Meat, it cures them. Fleſh, cured with Sea Salt, well freed from volatile and mineral Salt, does not much incommode the Bodies of Sailors, when they eat nothing but it, and dry Bread for a long Time. Horſes that are ſurfeited, greaſed, &c. ſo that they can ſcarce be recovered by any Medicines, are cured, made ſound and fat, by feeding upon the Graſs in the Marſhes, which the Tide overflows. Sea Salt purges, and I think, all volatile Salts and Spirits bind. Sea Salt, adheres to, and loads the volatile Salts in the Juices of dead Fleſh, that as great a Heat as that in one's Stomach, cannot agitate them much. It loads the Corpuſcles of Fire, that they cannot bear off the light Corpuſcles of the Fuel, which form Smoke; why may it not do the ſame in our Stomachs, and diſcharge them downward? Nay, why might not a Quantity of Sea Salt conſtantly taken, cure Conſumptions, and ſuch Diſeaſes as waſte the Body? and perhaps if it were diſtilled,

Its Uſes pointed at in ſeveral Diſorders.

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* Diarrhœas.

diſtilled, and the Spirits, and volatile Salts taken out that Way, or by Fire, it would be more effectual, than as 'tis commonly uſed; or Tartar, or any other fixed Salt might have the ſame Effects. If Fleſh in hot Seaſons, and hot Countries, need more Sea Salt, to fix the volatile Salts in it: If volatile Salts be the Occaſions of moſt of our Diſorders; why may not Bodies alive, too full of volatile Salts and Spirits, and kept too hot, need more Sea Salt to clog, bear down and diſcharge the volatile Salts and Spirits, and moſt, when they are moſt out of Order? Will any of our Abſorbents, or &c. have the ſame outward Effects? or if they had, when taken inwardly, will they not ſtop the Diſcharges? The Operations in the Stomach ſhould be firſt to diſſolve the craſs Matter, and afterwards to bear it off. Sea Salts, or any Bodies which are angular, and can be born up, and gently agitated with other Bodies in a Fluid, may diſſolve the other Bodies by Friction, and not fly off ſo quickly, or raiſe ſo great a buſtle, or make ſo great an Expanſion, or carry off ſo great Burthens, or ſo craſs Matter, as ſmaller, lighter, angular Bodies may, and may operate more in a thicker Fluid, and leſſer in a thinner Fluid than

Of lea-ven'd Bread.

ſmaller Salts can. They uſe, about one third Sea Salt, and two thirds Paſte mixed together, and kept two or three Weeks to make Leaven to mix with and begin a Ferment in Dough. Whether the Piece of Dough would, if kept moiſt, turn acid without the Salt, or whether the volatile or mineral Salts mixed in the Sea Salt, occaſion the Ferment, or whether the acid Parts in the Dough, are freed by Friction againſt the Points of the Sea Salt; deſerves to be examined and conſidered. All ſorts of Vegetables are difficult to be digeſted, by Fermentation, Boiling, or in the Stomach; and Grain, as difficult as any; and the Juices only go off, and the the greateſt Part remains in excrementitious Matter. Whether, moſt of them would not be more wholeſome, if they underwent ſome previous Preparation by Sea Salt; and particularly, whether Bread needs not more Fermentation, or better Preparation for Diſſolution, than by mixing it with Barm, which only huffs it up, and which is the tougheſt, craſſeſt Part, or the Excrements of Drink, makes it ſwim upon the Fluid, and entangles the active Corpuſcles in it, and thoſe it meets with in our Stomachs, makes our Excrements tough and hot, and more difficult to be diſcharged, and hath quite the contrary Effects, that Bread leavened after the Manner aforeſaid has, which ſinks in the Fluid, is ſooner diſſolved, &c. As the volatile Salts may do great Miſchief, for want of a ſufficient Quantity of Sea Salt to clog them, ſo too much Sea Salt may fix them, and the finer Juices in our Meat and Drink, too much; make the Blood too thick, and uncapable of furniſhing the finer Juices for diſcharging the Excrements, &c. and in that Caſe, freſh Diet will be a Remedy, as Salt was in the other. The Quantity and Manner of applying Sea Salt, whether to the Meat before we eat it, and how long before, or whether with the Meat freſh, when we eat it, deſerves the moſt curious Obſervation and Experiments; and with Reſpect to the Quantity of volatile Salts or Spirits, each Perſon eats or drinks; the Degrees of Heat they uſe their Bodies to, &c. Sea Salt, that hath been ſome Time in the Meat, is in ſome Meaſure ſheathed with the phlegmy Parts of the Meat. Whether it may not fix the volatile Salts more ſo, than when it is taken naked into the Stomach, and whether that be not the Cauſe that it binds us more, deſerves alſo

The Effects of too much.

The Quantity and Manner of uſing it ought to be nicely conſider'd.

alſo to be conſidered, and the different Effects it may have by the Qualities of the Matter it ſhall be taken in. If a conſiderable Quantity of Salt, be taken in Water-Gruel, or other thin Fluid faſting, may it not fret the Glands of the Stomach or Guts, go off in too great Quantity into the Blood, or &c. more than it would do, if taken with Meat, or thicker Fluids, and the Qualities of the Matter it will meet with in the Stomach, or which may be ſecreted into it, as Remains of the Meat, Phlegm, ſharp Juices, &c. For whatever opens the Glands in the Stomach, will, beſides its own Operation, occaſion a farther Operation by the Juices admitted into the Stomach, according to their Quantity and Quality, moſt at firſt, and as it is repeated, and the Juires waſted, leſs and leſs. Therefore I think Salt moſt proper to be uſed as a Diet. And when there is too great a Stock of ſharp Juices in the Blood, they may be more ſafely carried off by ſofter Matter, of which next.

CHAP. XXXVII.

Obſervations upon, and Compariſons between the Effects of eating freſh Fruits, green Herbs, and dried Fruits, &c.

Nature points out the Time of uſing them.

THE various Seaſons of the Year in each Country, and the Difference of the Climate, in Countries of different Latitudes, in ſome Meaſure point out the Uſes of the particular ſorts of Plants, Fruit, &c. variouſly adapted; ſome, only for the preſent Time, by Reaſon they cannot be preſerved; ſome for Weeks, ſome for Months, and ſome for the Winter Seaſon, becauſe according to their ſeveral Compoſitions, ſome are, and ſome are not, liable to rot, corrupt, or decay. The Spring raiſes the tender young Bloſſoms and Herbs, whoſe Corpuſcles are light; the greateſt Heat raiſes Fruit and Herbs to their full ſize, whoſe Corpuſcles are then the coldeſt or heavieſt. In the delining Heat, thoſe Corpuſcles are fermented and divided, perhaps ſome born off, and ſome others ſucceed, and thereby rendered lighter or warmer, or ripened. Some, by being kept after gathering, undergo a ſort of Fermentation, which divides the Juices, looſens the volatile Salts and Spirits, throws off ſome of the humid, cold Parts, and perhaps admits Corpuſcles of Fire, volatile Salts, &c. into the contracted Pores. All Children, and young People, whoſe Bodies are very hot and uneaſy in hot Seaſons, are mightily pleaſed with eating cooling Fruit, and are as naturally inclined to chooſe it by Experience, as we are to take Food in general, when we are hungry, or Drink when thirſty. The Scurvy, Gout, and ſuch like Diſorders in the Blood, ſeem to be chiefly occaſioned by eating ſuch ſorts of Food, and drinking ſuch ſorts of Drink as aſſiſt not, or hinder the Juices from ſecreting into the Stomach and Guts, and diſcharging them downward, and the Body is frequently rendered unhealthy, and ſometimes even emacerated by the Sharpneſs or other Qualities of theſe Juices, abounding in the Blood. Horſes kept in the Houſe with dry Meat, eſpecially with much Corn, will not be well without Purging, or Bleeding, becauſe their Blood grows too ſharp, or too thick for want of diſcharging the Juices into the Stomach and Guts, which will occaſion the Yellows, and ſeveral other Diſorders.

Children love Fruit.

The Origin of Gout and Scurvy.

Diſorders. When on a ſudden, the Seaſon becomes very hot, and the Body is full of volatile Salts and Spirits, the Steam within rarified, and too thin and volatile, and the outward Pores too open, the Blood will be too thin, the Steam will pervade the Blood and Pores, hurry off too faſt, and leave the Body hot and faint, and then Alloys are abſolutely neceſſary. Indeed, when the Steam is very ſtrong, hot and ſubtile, and the Pores open, it bears off groſſer Corpuſcles into the Blood, and ſo in Time makes the Blood more difficult to be pervaded or born off. And when the Corpuſcles in the Blood are groſs, and the Pores are ſhut on a ſudden, the Steam ſhould not be ſuffered to abate ſuddenly. The Juices in new-gathered or unwithered Fruit, or green Herbs, are capable of raiſing ſome ſort of a Ferment, in the Stomach and Guts, either by their Motion in Diviſion, or by their Expanſion, or &c. till theſe Juices are born off or ſheathed or balanced, which thoſe of dry'd Fruit or Herbs, out of which the volatile Humidity is gone, or the Juices of Fruit or Herbs fermented, will not do. Perhaps it may be the greener, or leſs fermented, or leſs dry'd the Meat or Drink is, the groſſer the Steam is which riſes

The different Effects of green and dry Fruits.

riſes from it, and therefore goes not off ſo freely, but extends the Stomach and Guts, or perhaps it may proceed from a greater Quantity of Juices, which they may occaſion to be iſſued into the Stomach and Guts, or from all theſe Cauſes jointly. If when the Juices are ſharp, and the Steam ſubtle, one eats a moderate Quantity of cold Fruit, it makes the Steam groſſer, and fitter to drive the Blood, and abate the Expence or Waſte of the Steam, and by condenſing the Steam at firſt, gives an Opportunity to the Stomach and Guts to contract, and to the Blood to repleniſh the Veſſels in the ſides of the Stomach, Guts, &c. with Juices to be ſecreted into the Stomach, which are the principal Agents to diſſolve the Contents in the Stomach, and raiſe them into more Steam, and into the Guts, for diſcharging the Excrements downward, &c. Great Caution ſhould be uſed at the firſt eating of Fruit, for it is as unſafe for thoſe to eat cold Things who are uſed to hot, as 'tis for thoſe, who are not uſed to ſtrong Drink or Exerciſe, to uſe much the firſt Time, becauſe the Glands will ſecrete too great a Quantity of Juices, and cauſe a Surfeit or Fever. If cold Fruit, be eat before Meat for ſome Time, ſo that the Stomach contract and diſcharge the Juices, and theſe the Excrements plentifully, the Stomach will contract ſo much, that upon Eating or Drinking at firſt, you will feel a Fulneſs, and an Inclination to vomit, and upon drinking a ſmall Quantity of ſtrong Drink, which is neceſſary, the Pulſe will be ſtrong and quick, without any great ſenſe of Heat in the Body. When with eating Fruit, Herbs, or other cooling Diet, there is a plentiful Secretion out of the Blood into the Stomach and Guts, and a free Diſcharge of the Excrements downward, or a Looſeneſs; it carries off the Matter which filled the outer Parts too full, and leaves the Limbs cool, and of a due Thickneſs in Man, Horſe, Beaſt, &c. If this be done faſter than the proper Juices can be ſeparated into the Glands, and the Glands kept open, the Blood will puſh the thinneſt Juices through the Ducts and Glands promiſcuouſly; thoſe Juices will be unfit for Digeſtion, and will be wanted in other Parts where they would be uſeful. As the groſs Steam raiſed out of green Plants or undried Fruit, cannot go off ſo faſt, therefore it extends the Guts, Belly, and Parts of Creatures, whilſt they feed upon them, much more than the fine Steam raiſed out of dry'd Plants, Fruits, &c. when they feed upon them. When the Muſcles and Ligaments, ſuffer the Steam to extend the Belly out of Courſe, 'tis not a ſign of Strength, but of Weakneſs, and the Food ſhould be changed, for if the Parts are not ſupplied with Nouriſhment ſufficient, with the Compreſſure of the Air, to keep the Guts within their common Compaſs; as the Strength depends upon forcing the Steam out of the Stomach and Guts, the more they give Way to the Steam, the more the Strength will diminſh. It ſeems to me, that there is no Method more likely or ſafe to make the Juices ſecrete into the Stomach, diſcharge them downward, contract and ſtrengthen the Stomach, abate the ſharpneſs of the Steam and Juices in the Blood, and reſtore a good Conſtitution, than by a moderate Uſe of new-gathered, or freſh Fruit and Herbs, about an Hour before each Dinner. The Diſorders occaſioned by eating exceſſive Quantities of Fruit at once, make the Phyſicians forbid the Uſe of Fruit to People in Diſorder. But that ſhould no more diſparage the Uſe of it, than the ill Effects of Drunkenneſs, the Uſe of Wine, ſtrong Drink, &c. The Inhabitants of the nor-

Practical Hints upon theſe Obſervations.

thern Countries, where there is little or no cooling Fruit, are full of the Scurvy. Thoſe of the ſouthern Countries are ſeldom troubled with it. Thoſe who have been bred in the ſouthern Countries, and eaten much Fruit, and afterwards live in the northern Countries, and eat little Fruit, are moſt troubled with it; beſides we daily ſee Horſes and other Brutes that will eat Graſs when they are in ſuch Diſorders by dry Food, Surfeits, &c. reſtored to Health in a Month's Time by freſh Graſs, when all other Means have been ineffectual. Obſervations ſhould be made, whether the Corpuſcles of thoſe Plants which cure the Farcy, and ſuch like Diſeaſes, are not very heavy and cold, and of what Nature, and in what Quantity the Spirits and Salts in them are. As Care ought to be taken of the Quantity of cold Fruit, Herbs, &c. which one eats at once, becauſe Exceſs will occaſion Surfeits, &c. ſo alſo Care ought to be taken of the Quality of them, for there are ſome Fruits and Herbs ſo cold, that neither the Juices in the Stomach of Man nor Beaſt can raiſe them into Steam, nor diſcharge them without Surfeits, Fluxes, &c. ſo alſo of the Time of uſing proper Quantities, and of proper Sorts, for if one

Cautions about eating Fruits and Sallads.

one uſe any ſort too long, it will make one pale, and weak. We uſe Pepper with Cucumbers, &c. which immediately nettles the Stomach, and makes the Juices iſſue to raiſe a Steam, and diſſolve them. What Operation can two or three Grains of ſuch Matter have in the Stomach, other than in opening the Glands, and raiſing a quick Ferment? Or how can cold Things raiſe ſuch a Combuſtion, as to cauſe a Surfeit or Fever, if Juices did not ſecrete? Or how could hot ſpirituous Things prevent ſuch Combuſtions, if they did not raiſe a briſk Ferment, and prevent too many Juices from iſſuing in? The cooler or heavier the Diet, the more Juices it naturally calls in, and the more of them it carries off, and ſpirituous hot Things need leſs Juice out of the Blood to digeſt them, and ſo extend the Stomach, and keep them out. If by eating cold Fruit, drinking ſmall Liquor, &c. the Stomach be cooled too much, or kept cool too long, too great a Quantity of bitter ſharp Juices flow in, in ſmall Quantity cauſe Belching, in great Quantity, Surfeits. 'Tis not ſafe to drink any conſiderable Quantity of ſtrong Drink, when the Juices are kept diſcharged out of the Glands by Fruit or other cool Diet, for then the lacteal Veſſels are very open, and the Steam heightened by the Juices and ſtrong Drink, throws off too much into the Blood. Too much Action will have the like Effects; and the Matter ſo thrown off, is apt to fall into the Legs or lower Parts: If the Steam be too near ſpent by Heat, 'tis not ſafe to eat any cold Fruit, nor ſcarce any cold Meat, for fear of overſetting the Steam, or occaſioning a Surfeit, by making the Stomach contract too much, iſſue too many Juices, &c. But 'tis more proper to drink a ſmall Quantity of ſtrong Drink to recover the Steam immediately, and after that is done, cold Meat will do leſs Hurt. If one perceive any Diſorder by eating or drinking cold Things when hot; or by faſting, ſuch as the Gripes, &c. which frequently happens, ſtrong Drink, or rather hot ſtrong Drink, taken ſuddenly, will prevent farther Damage; but if it be taken after the Juices be ſecreted in too great Quantity, and the Ferment raiſed, it may do Harm, for 'tis very likely, there may be ſuch a Quantity of ſharp Juices in the Body of a healthful Perſon, which diffuſed through the Blood do no Harm; but if the Steam in the Stomach were kept condenſed till they could be ſecreted into it, would raiſe a Ferment to blow up the whole Frame. Horſes, or Beaſts with dry Meat, drink as much cold Water as they can at once, if they be permitted twice a-Day, or oftener, which is the only Alloy they have to condenſe the Steam, contract the Stomach, and give an Opportunity to the Glands in the Stomach and Guts to fill with Juices. A moderate Quantity of cold Water, or other weak Liquor, doubtleſs condenſes the Steam, and makes the Stomach contract; but the Parts of Water are ſo light, that unleſs one take a very great Quantity, the Heat of the Body in a ſhort Time takes off the Cold, and raiſes a Steam before any great Quantity of the Juices can be ſecreted into the ſmall Veſſels and Glands, and thence into the Stomach, and repels the Blood, and extends the Stomach. But when the Body is very hot, the Steam high, and the Juices very thin, and little remaining in the Stomach, if one drink a conſiderable Quantity of cold Water, it wholly condenſes the Steam in the Stomach, and perhaps ſome may paſs down into the Guts before the *Pilorus* can ſhut, and it will abate the Strength of the Steam iſſuing out of the Guts, ſo far, that immediately that which perſpires will ſtick upon the Skin in Form of Water, which the Moment before was born off inviſibly, and will continue to do ſo, if you keep hot, till moſt of the Water be born off, and if one reſt, it may ſtagnate the Juices ſo far in the Stomach and Guts, that the Steam will not be ſufficient for ſome Time to circulate the Blood, but the Blood will precipitate, and fall down into the Limbs, and when the Juices iſſue in Quantity, or one drinks ſtrong Liquor to carry off the Water in Steam, all the Juices return with it into the Blood. Where a Perſon keeps his Stomach always extended with hot ſtrong Things, and ſo fills the Blood full of ſharp Juices, vomiting and purging ſignify little, they only diſcharge the Juices collected in the Glands when they begin to operate, and after that a Miſcellany of all the ſorts of Juices which the Ducts and Glands can ſecrete, and leſſen the Quantity of all the ſorts that can paſs there, and for the preſent does ſome Good and ſome Hurt. But Part of thoſe Juices get back in the Operation into the Blood, and thoſe which are left behind in the Guts, are not clogged but rather ſharpened, and afterwards alſo get off into the Blood, and if the ſame ſort of Diet be continued, the ſame

Nothing can rectify the whole Maſs but a conſtant Diet.

ſorts of Juices will in Time again abound in the Blood, nay even faſting will not correct thoſe ſharp Juices, for that will make them flow in, and act almoſt alone, and become ſharper. And nothing will ſufficiently change the Conſtitution of the Blood and Juices, but a conſtant Diet, which will let the Stomach contract, the Juices come in, clog, alloy, and diſcharge them downward, and ſupply the Blood with freſh cool Juices.

CHAP. XXXVIII.

The natural Efforts made by the Agents to remove the Matter which offends or obſtructs, and to prevent too great Emiſſion of the Juices outward or inward; in ſhort, to keep every Thing in Order, and to repair every Thing which is out of Order.

All Diſeaſes are Efforts of the Agents to clear themſelves.

IT appears in thoſe we do underſtand, and 'tis likely it would appear ſo in all the reſt, if we underſtood them, that all thoſe Effects we call Diſeaſes are Efforts of the ſeveral Agents to cure thoſe Diſeaſes; and that Things are ſo ſurpriſingly framed and qualified, without and within us, to preſerve us, that not one Diſorder befals us by accidental, nay ſcarce by wilful Means, but all the Agents conſpire to remedy it, ſo that almoſt nothing but Violence, or a conſtant Courſe of abuſing ourſelves, can kill us; nor any Thing we can eat or drink, can hurt us much, as it comes naturally, but the Parts offended, will diſcharge it by vomiting, purging, or &c. except Art has made it pernicious, ſuch as Liquors fermented ſo much, and kept ſo long, that they are too acid, ſharp and thin, or Spirits which are freed ſo much, that they are too volatile, &c. which may leiſurely lodge a great Stock of improper Juices in the Blood, or ſuch Things as we eat or drink, or uſe in Phyſick, which are fermented or mixed with deadly Poiſons, pointed Salts, &c. as will appear by repeating a few of the Inſtances interſperſed throughout the whole. When Exerciſe ſpends the Juices and Strength, it increaſes the Steam to ſupply them. When we are too hot, Heat opens the Pores to diſcharge the Steam. When the Steam is ſtopped, its Force increaſes to remove the Obſtruction, when Cold thickens the Blood it ſhuts the Pores, and keeps in the Steam to thin it. When the Pores in the Skin diſcharge,

These Efforts demonſtrated.

leſs is diſcharged by the Lungs, by the Urine, by the Glands, by the Noſtrils, &c. When any of the Juices are ſtopt or ſtagnated, the Steams force their Way, till they remove the Obſtacle, or diſſolve them, or inflame the Parts, and diſcharge them there. When there are too many ſharp Juices thrown out of the Blood into the Stomach, the Ferment riſes till it can diſcharge them. When Phlegm increaſes, it ſtraightens the Paſſages, and ſtops the Salts to diſſolve it. When Salt, or any Thing wounds the Glands, they open, and the Steam forces the Juices to ſecrete, which opens the Paſſages to diſcharge them; when any Thing ſtops, or wounds the Glands in the Lungs, we cough to throw it off, and thoſe Efforts augment the Force of the Steam. When the Steam drives the Blood with too great Force, thins it too much, and makes too great Secretions, it extends the Blood-veſſels, and ſtraightens the Glands. When the Steam is ſpent, or the Agents too much loaded with craſs Matter, we grow ſenſeleſs till it be repleniſhed or thinned.

The Neceſſity of the Knowledge of the Agents.

Upon the whole, it will appear how nice, and how dangerous a Thing it is, for thoſe who go to work in the Dark, know not the Agents that act in and about the

Body, nor the Laws by which they act, what they are doing, nor which of them prevails to interpoſe by Force among them. Such muſt frequently thwart and oppoſe the Courſe they naturally take to cure us, weaken, or bind the Hands of thoſe who are aſſiſting us; and ſtrengthen or arm thoſe who are deſtroying us.

The Circulation of the Blood, though it admit of ocular Demonſtration, was not diſcovered till very lately. And tho' the firſt who thought of it was one of the greateſt in the Faculty, he was ſcarce able to ſupport himſelf under the baſe Treatment he received from his Contemporaries, for attempting that noble Diſcovery. Therefore as one who is not of the Faculty, and attempts a Thing of this Nature, muſt expect to be much worſe treated, and will not be ſo able to defend himſelf by Opinion, Circumſtances, or any other ſort of Evidence, unleſs he can prove it by ocular Demonſtration (which I hope I ſhall have Opportunity to do) and even then have no Advantage by it; 'tis the ſafeſt Way either to publiſh it without diſcovering the Author, which is very difficult to be done, or leave it behind one, thoſe Parts which concern the Agents, which circulate the Blood, to the Judgment of thoſe who underſtand what Laws Nature hath given Fluids to act by; and the Obſervations which are foreign to that Affair, or the Opinions I have given upon them, to every Man's own Experience.

DIXI.

Harvey, who as hinted above, was not only ſure that the Cauſe of the Circulation of the Blood was not in the Heart; but is for the ſame Agent with our Author, concludes in a Matter not altogether unlike Mr. *Hutchinſon*, therefore we have thought it not much amiſs to cite the Paſſage. *Exercitat. Anatom.* 3^{tiæ}, pag. 159. " In this Manner I opine, that the *innate* " *Heat* (or Blood) as it is the common " Inſtrument of all Operations in us, ſo is " it the chief Efficient of the Pulſation of " the Arteries, I don't confidently aſſert " this, only propoſe it as an Hypotheſis, " and would be glad to know what any " of the Learned have againſt it, but without Scurrilities, reproaching Language, " or contumely, and whoever undertakes it " thus, will undertake a Work moſt acceptable to me." See what he means by his innate Heat, in his Treatiſe *De Generat. Animal. Exercitat.* LXXI. So here he ſays the Blood alone is the innate Heat, or the firſt created animal Heat.

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FINIS.

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